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FM 4-5

WAR DEPARTMENT

COAST ARTILLERY
FIELD MANUAL



SEACOAST ARTILLERY
ORGANIZATION AND TACTICS

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FM 4-5

COAST ARTILLERY FIELD MANUAL



SEACOAST ARTILLERY ORGANIZATION AND TACTICS

**Prepared under direction of the
Chief of Coast Artillery**



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BY ORDER OF THE SECRETARY OF WAR:

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COAST ARTILLERY FIELD MANUAL

SEACOAST ARTILLERY

ORGANIZATION AND TACTICS

(The matter contained herein supersedes part one, Coast Artillery Field Manual, volume I, January 3, 1933.)

PART ONE

ORGANIZATION

CHAPTER 1

FUNDAMENTALS OF ORGANIZATION

■ 1. MILITARY ORGANIZATION.—*a.* A military organization is a group of troops operating as a unit under a leader or commander, and performing a particular duty or class of duties. Two important factors influencing organization of units are control of the unit and duty to be performed by the unit.

b. There is a limit to the number of individuals that a single commander can control effectively. To insure effective control, an organization containing more individuals than can be controlled by a single commander is subdivided into several smaller organizations, each functioning under its own commander. The commander of the larger unit is then able to control effectively action of the smaller units through their unit commanders.

c. If a number of organizations are engaged in performing the same duty, teamwork will be secured by placing them under a single commander. On the other hand, administration, supply, and training can often be handled most efficiently by keeping units in the same area under the same control. This factor may require that a unit be included in one organization for one purpose and in a different organization for another purpose.

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■ 2. FUNDAMENTAL ELEMENTS OF A MILITARY ORGANIZATION.—

The fundamental elements in any military organization are—

a. Command elements, consisting of a single head or commander, together with such assistants or staff officers as are necessary to relieve him of the burden of details and enable him to exercise adequate control over his command.

b. Combat elements, consisting of such combat troops as are necessary to carry out the combat mission assigned to the organization.

c. Service elements, consisting of such technical, supply, or administrative services as are necessary to maintain fighting efficiency of combat elements as well as to carry out any service mission assigned to the organization.

■ 3. COMMAND ELEMENT.—The command element may be divided into three parts, commander, staff, and enlisted assistants.

a. Commander.—(1) All orders and instructions from a higher unit to a subordinate unit are given to the commander thereof, and each individual commander looks to his immediate superior for necessary orders and instructions. By this means authority and responsibility are definitely fixed and the channels of command are definitely established.

(2) The commander of any unit is responsible to his superior for all the unit does or fails to do. Guided by orders issued by his superior, he directs all activities of his own unit. He is responsible for all policies, plans, or basic decisions which affect condition, morale, supply, training, discipline, administration, and employment of his command. He cannot avoid this responsibility. His authority over all elements of his organization is complete and final.

b. Staff.—(1) As the number of elements or units grouped under one commander is increased, a point is soon reached where the multiplicity of details requiring consideration by the commander is so great that they cannot be handled by one person. Beginning at this point, each unit commander is provided with an appropriate staff. The staff consists of those officers specifically designated for the purpose of assisting the commander in exercising his command functions. Certain of these officers have no duties other than staff duties, while

others have staff duties in addition to their primary functions as commanders of combat or service troops.

(2) The organization of a staff is based on the duties of the commander. It is prescribed in Tables of Organization, in Army Regulations, and in Field Manuals.

(3) The staff constantly anticipates and provides for needs of the troops. It secures information for the commander, works out details of his plans, translates his decisions and plans into orders, causes such orders to be transmitted to the troops, and observes the execution of these orders. It anticipates and initiates action within the scope of its authority to complete carrying out the commander's intentions. A staff officer as such has no authority to command. Policies, basic decisions, and plans must be authorized by the commander. When it is necessary for a staff officer to issue an order in the name of the commander, responsibility for the order remains with the commander even though it was issued without his personal knowledge.

c. Enlisted assistants.—Commanders and staff officers are provided with enlisted assistants who function as clerks, typists, draftsmen, surveyors, linemen, telephone and radio operators, messengers, chauffeurs, orderlies, and observers.

■ 4. COMBAT ELEMENT.—The combat element of an organization is composed of the men whose principal mission is to man and operate weapons with which the unit is armed together with such auxiliary devices as are necessary for successful operation of the weapons. It is the fighting element of the organization. It is the duty of this element to maintain its weapons and equipment in proper condition, to be able to employ them efficiently in combat, and to be prepared to fight at such times and places as the commander may direct.

■ 5. SERVICE ELEMENT.—The service element consists of the organizations or parts of organizations having the mission of administering to personnel and matériel requirements of the unit as a whole. Service elements vary in size from small detachments to large organizations formed for a particular kind of service. Regimental service batteries, battalion ammunition trains, and battery maintenance sections are examples of service elements.

■ 6. TABLES OF ORGANIZATION.—Organization of military units is shown in Tables of Organization. Tables of Organization (abbreviated T/O) prescribe in tabular form the organic structure of military units, including subdivisions, and personnel with qualifications thereof. For purposes of information they also show authorized allowances of weapons, transportation, and principal items of equipment for the unit to which each pertains. For units active during peace or which are mobilized at peace strength they show both peace and war strengths.

a. *Peace strength* (abbreviated P) is the minimum strength in personnel and equipment with which a unit can operate effectively as a part of a balanced combat team under initial war conditions.

b. *War strength* (abbreviated W) is the minimum strength in personnel and equipment with which a unit can operate effectively as a part of a balanced combat team under prolonged war conditions.

c. *Enlisted cadres* are included in Tables of Organization. An enlisted cadre for a unit is the minimum number of key enlisted men necessary to initiate organization and training of a new unit of that type.

d. *Major items of equipment* shown in Tables of Organization are extracted from Tables of Basic Allowances. Each item of equipment is preceded by a capital letter designating the supply arm or service which supplies the particular item, as Q—Quartermaster Corps, O—Ordnance Department, E—Corps of Engineers.

CHAPTER 2

ORGANIZATION OF SEACOAST ARTILLERY UNITS

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SECTION I

HARBOR DEFENSE UNITS

■ 7. GENERAL.—*a.* Coast artillery troops to be assigned to harbor defense armament are organized as regiments of types "A," "B," or "C," or as separate battalions, type "D." The type of organization assigned to a harbor defense is governed by tactical requirements of the harbor defense.

b. The harbor defense regiment or separate battalion is composed of a complete command element, a partial combat element, and a very limited service element. Armament and matériel and service elements necessary to complete the organization are assigned to the harbor defense and not to the regiment or separate battalion. Thus the combination of a harbor defense regiment or separate battalion and the harbor defense to which assigned forms a complete military organization.

c. Harbor defense regiments are organized to facilitate administration and training of civilian components and their assignment to harbor defenses upon mobilization, and to minimize the amount of reorganization required should it become necessary to reassign a harbor defense organization to mobile artillery. When assigned to harbor defenses, tactical functions are charged to harbor defense tactical subdivisions (par. 40e), and the greater part of the administrative functions to the harbor defense and fort (par. 41). Responsibility for training may remain with the regimental and battalion commanders or all or part may be charged to tactical commanders. In the tactical organization of the harbor defense

every effort is made to assign complete organizations as tactical subdivisions with the organization commanders assigned as tactical commanders thereof (par. 37c (5)) in order that division of responsibilities may be avoided.

d. Tables of Organization prescribe in detail the organization of harbor defense units.

Type	Head-quarters ¹		Head-quarters battery ¹		Band ²	Searchlight battery ²	Battalions ²	Batteries ²
	W	P	W	P	W and P	W and P	W and P	W and P
"A" (regiment).....	10	6	135	98	1	1	3	9
"B" (regiment).....	9	5	116	83	1	1	2	6
"C" (regiment).....	11	7	158	116	1	1	4	12
"D" (separate battalion)....	10	5	154	105	None	None	None	5 (W); 3 (P)
"A," "B," and "C" (battalion).	5	2	43	21	None	None	1	W and P 3

¹ Strength of organization.

² Number of units.

FIGURE 1.—Comparative organization, harbor defense regiments and battalions.

■ 8. REGIMENT, TYPE "A" (T/O 4-61).—a. Type "A" harbor defense regiment consists of a headquarters and headquarters battery, a band, a searchlight battery, and three battalions of three firing batteries each, with medical personnel and a chaplain attached. In time of war all of the organizations except the band are increased in size, but the number of organizations remains unchanged (see fig. 1).

b. *Regimental headquarters* (T/O 4-62) of type "A" regiment consists of the regimental commander and, at war strength, a staff composed of an executive, adjutant, intelligence officer, plans and training officer, supply officer, com-

munication officer, assistant adjutant, assistant plans and training officer, and assistant communication officer. At peace strength only five officers are assigned to the staff, staff duties being combined as directed by the regimental commander.

c. *Regimental headquarters battery* (T/O 4-62) is organized for the purpose of providing the personnel necessary to assist the commander and his staff in the performance of their duties. It consists of a battery headquarters section containing the battery command echelon; operations, communication, and supply platoons which furnish details to assist in the administrative, tactical, and technical functioning of the regimental staff; and a maintenance section which furnishes details necessary for operation of the mess, supply, and maintenance facilities of the battery, and for operation and maintenance of transportation, power plants, and fixed fire-control systems assigned to the regiment.

d. The *searchlight battery* (T/O 4-68) is a type battery provided in the harbor defense regiment for the purpose of manning the harbor defense seacoast and antiaircraft searchlights. It consists of a battery headquarters section, a maintenance section, a seacoast platoon, and an antiaircraft platoon. The type battery has sufficient personnel to man eight seacoast searchlights and five antiaircraft searchlights and sound locators. The type battery must be increased or decreased in size depending upon the actual number of searchlights present in the harbor defense to which it is assigned. The battery commander functions as the harbor defense searchlight officer. In the type "A" regiment this battery is designated as "Battery K."

e. The *band* (T/O 4-62) consists of a warrant officer and 28 enlisted men. It is commanded by the regimental adjutant and trained by the warrant officer. For details regarding the organization, duties, and formations of the band see FM 28-5.

■ 9. REGIMENT, TYPE "B" (T/O 4-71).—a. The principal difference between type "B" harbor defense regiment and type "A" regiment (par. 8a) is that type "B" regiment has only two battalions of three batteries each instead of three. Additional differences are found in sizes of the headquarters and

headquarters battery and the medical detachment (see fig. 1).

b. *Regimental headquarters* (T/O 4-72) is organized in a similar manner to and performs the same functions as the regimental headquarters of type "A" regiment (par. 8b). This organization is slightly smaller than that provided for type "A" regiment, no assistant communication officer being provided in time of war, and only four officers instead of five are assigned for peacetime staff duty.

c. *Regimental headquarters battery* (T/O 4-72) is organized in the same manner and performs the same functions as the headquarters battery of type "A" regiment (par. 8c). This battery is smaller than the corresponding battery of the type "A" regiment.

d. The *searchlight battery* (T/O 4-68) is identical to that found in type "A" regiment (par. 8d). In type "B" regiment this battery is designated as "Battery G."

e. The *band* (T/O 4-72) is identical to that found in type "A" regiment (par. 8e).

■ 10. REGIMENT, TYPE "C" (T/O 4-81).—a. The principal difference between type "C" harbor defense regiment and type "A" regiment (par. 8a) is that type "C" regiment has four battalions of three batteries each instead of three. Additional differences are found in sizes of the headquarters and headquarters battery, the medical detachment, and the number of chaplains attached (see fig. 1).

b. *Regimental headquarters* (T/O 4-82) is organized in a similar manner to and performs the same functions as the regimental headquarters of type "A" regiment (par. 8b). This organization is slightly larger than that provided for type "A" regiment, an assistant supply officer being provided in time of war, and six officers instead of five are assigned for peacetime staff duty.

c. *Regimental headquarters battery* (T/O 4-82) is organized in the same manner and performs the same functions as the headquarters battery of type "A" regiment (par. 8c). This battery is larger than the corresponding battery of type "A" regiment.

d. The *searchlight battery* (T/O 4-68) is identical to that found in type "A" and "B" regiments (par. 8d). In type "C" regiment this battery is designated as "Battery N."

e. The *band* (T/O 4-82) is identical to that found in type "A" and "B" regiments (par. 8e).

■ 11. **BATTALION, TYPES "A," "B," AND "C" (T/O 4-65).**—*a.* The battalion consists of a headquarters and headquarters battery and three firing batteries. In time of war each of these organizations is increased in size, but the number of organizations remains unchanged (see fig. 1).

b. Battalion headquarters (T/O 4-66) consists of the battalion commander and, at war strength, a staff composed of an executive, adjutant, intelligence officer, plans and training officer, and communication officer. At peace strength only one officer is assigned to the staff.

c. Battalion headquarters battery (T/O 4-66), though much smaller, is organized in the same manner and performs the same functions for the battalion commander and his staff as the headquarters battery of the regiment (par. 8c).

■ 12. **SEPARATE BATTALION, TYPE "D" (T/O 4-95).**—*a.* The separate battalion, type "D," is organized for the purpose of providing a unit smaller than a regiment for manning a small harbor defense. It consists of a headquarters and headquarters battery and three firing batteries at peace strength or five at war strength with medical personnel and a chaplain attached. Neither a band nor a searchlight battery is assigned to the separate battalion (see fig. 1).

b. Separate battalion headquarters (T/O 4-96) consists of the battalion commander and a staff which at war strength is identical to that assigned to a type "A" regiment (par. 8b), except for the substitution of a searchlight officer for the assistant communication officer.

c. Separate battalion headquarters battery (T/O 4-96) is organized in the same manner and performs the same functions as the headquarters battery of type "A" regiment (par. 8c), except that it contains a searchlight section replacing the searchlight battery assigned to the regiment.

■ 13. **FIRING BATTERY, (T/O 4-67).**—*a.* The harbor defense firing battery as set up in Tables of Organization is a type battery provided for assignment to any type of harbor defense weapon except mines. The type battery consists of a battery headquarters composed of a command detail and

range and communication sections, a firing section, an executive officer's detail, and a maintenance section. The actual number of gun sections in the firing section will vary from one to four, and the personnel for each section will vary depending upon the caliber and type of weapon manned by the battery. (See FM 4-15 for range section and field manual of service of the piece of weapon with which battery is armed.) The battery is an administrative and technical unit. It is organized for service of the armament to which it is assigned.

b. The term *firing battery* is used to designate the personnel employed to man the assigned armament. Administratively the term "battery" includes headquarters, searchlight, mine, and firing batteries. Tactically the term "battery" is applied to a complete combat unit (par. 42) consisting of a searchlight, mine, or firing battery together with the armament and equipment assigned thereto.

c. Firing batteries are designated within the regiment or separate battalion by letter, for example, "Battery A," "Battery B."

■ 14. MINE AND UNDERWATER RANGING BATTERIES.—a. *General.* Requirements of harbor defenses for mine batteries and for underwater ranging batteries vary with local situations. Batteries of these types are therefore not included in normal regimental and separate battalion organizations. When required in a harbor defense, the mine battery replaces one of the firing batteries and is designated by the letter of the firing battery that it replaces, no increase being made in the number of batteries assigned. When an underwater ranging battery is required, it is added to a regiment stationed at the harbor defense as an additional lettered battery and the regimental organization is increased accordingly.

b. The *mine battery* (T/O 4-69) is a type battery provided for the operation of a harbor defense mine field. Its strength will vary depending upon the particular mine field to which it is assigned. It consists of a battery headquarters, composed of a command detail and a range section; a battery maintenance section; and a mining section composed of mine property, loading, planting, flotilla (less mine planter), and casemate sections.

c. Under water ranging battery (T/O 4-77) is a type battery provided in event of an emergency for operation of under water ranging equipment of a harbor defense. Its strength will vary depending upon the number of base lines to be operated. It consists of a battery headquarters and command detail; an operating platoon for each base line composed of a range section, a listener section, and an echo ranging section; a mine yawl section; and a battery maintenance section.

SECTION II

TRACTOR-DRAWN ARTILLERY UNITS

■ 15. GENERAL.—Tractor-drawn seacoast artillery is organized into brigades, regiments, battalions, and gun batteries for purposes of administration, training, and to facilitate its tactical employment. Tables of Organization prescribe in detail the organization of each unit.

■ 16. BRIGADE (T/O 4-30).—*a.* The tractor-drawn brigade consists of a headquarters and headquarters battery, three regiments, and attached medical personnel and chaplains. The brigade will rarely be called upon to function as a tactical unit.

b. Brigade headquarters (T/O 4-10-1) consists of the brigade commander and a staff composed of the executive, adjutant, intelligence officer, plans and training officer, gas officer, munitions and supply officer, communication officer, assistant communication officer, and two aides.

c. Brigade headquarters battery (T/O 4-10-1) contains the personnel necessary to assist the commander and the staff in the performance of their duties. Its organization is typical of all mobile seacoast artillery headquarters batteries. It is organized into sections and details each designed for accomplishment of a particular duty, and each containing the personnel, equipment, and transportation necessary for its functioning. Certain sections are provided for the operation of the battery and other sections are provided for operation of brigade headquarters. That part of the battery that is to serve at brigade headquarters is termed the operations section. In general the operations section contains a separate section to assist each staff officer. The sections and details

into which brigade headquarters battery is divided are—

(1) *Battery headquarters section* to handle battery administration.

(2) *Battery maintenance section* to operate the battery mess and to handle battery supply and maintenance.

(3) *Brigade headquarters detail* to function under the brigade adjutant.

(4) *Intelligence detail* to function under the intelligence officer.

(5) *Plans and training detail* to function under the plans and training officer.

(6) *Communication detail* to function under the communication officer.

(7) *Munitions section* to function under the munitions and supply officer.

■ 17. REGIMENT (T/O 4-31).—*a.* The tractor-drawn regiment consists of a headquarters and headquarters battery, a service battery, a band, two battalions in time of peace and three in time of war, with medical personnel and a chaplain attached. The regiment is a complete military organization composed of command, combat, and service elements, and completely equipped with primary armament and fire-control apparatus. It is a tactical and an administrative unit.

b. Regimental headquarters (T/O 4-32) consists of the regimental commander and, at war strength, a staff composed of the executive, adjutant, intelligence officer, plans and training officer, supply officer, communication officer, gas officer, munitions officer, reconnaissance officer, assistant communication officer, and assistant plans and training officer. At peace strength only six officers are assigned to the staff, the staff duties being combined as directed by the regimental commander.

c. Headquarters battery (T/O 4-32) is organized and functions in a manner similar to that of brigade headquarters battery (par. 16c).

d. Service battery (T/O 4-33) is organized for the purpose of procuring all supplies except ammunition from the various supply agencies, and issuing these supplies to the units of the

regiment. It is commanded by the regimental supply officer and is organized into the following units:

(1) A battery headquarters section and a maintenance section for operation of the battery.

(2) A regimental section consisting of a personnel detail and the supply officer's detail.

(3) A battalion section for each battalion. These sections are commanded by the battalion supply officers and are so organized as to permit their attachment to a battalion which is detached from the regiment. Each section has sufficient personnel and transportation to handle the supplies other than ammunition required by a battalion.

e. Band (T/O 4-31) is commanded by the adjutant and trained by a warrant officer. For details in regard to its organization, duties, and formations, see FM 28-5.

■ 18. BATTALION (T/O 4-35).—*a.* The tractor-drawn battalion consists of a headquarters and headquarters battery, an ammunition train, and two gun batteries. The battalion is normally a tactical unit but when detached from the regiment it becomes an administrative unit as well.

b. Battalion headquarters (T/O 4-36) consists of the battalion commander and, at war strength, a staff composed of the executive, adjutant, plans and training officer, intelligence officer, liaison officer, reconnaissance officer, communication officer, gas officer, supply officer, and munitions officer. At peace strength only four officers are assigned to the staff and staff duties are combined as directed by the battalion commander.

c. Battalion headquarters battery (T/O 4-36) is organized and functions in a manner similar to that of brigade and regimental headquarters batteries (par. 16c).

d. Ammunition train (T/O 4-39) is organized for the purpose of procuring ammunition required by the battalion from the ammunition supply point and transporting and issuing it to the batteries. The ammunition train is commanded by the battalion munitions officer. At war strength it is organized into a headquarters section and a maintenance section for operation of the battery, and two platoons for handling

of ammunition. Though unusual, a platoon may be attached to a gun battery that is operating at such a distance from the remainder of the battalion that ammunition supply by the battalion becomes impracticable. In this case the commander of the detached platoon is responsible for supply of ammunition to the battery.

■ 19. GUN BATTERY (T/O 4-37).—The tractor-drawn gun battery is organized into a headquarters section and a maintenance section; an operations section consisting of command post, communication, and reconnaissance details; and a firing battery consisting of two gun platoons of two guns each and a machine-gun detail. The battery is an administrative, technical, and under unusual conditions a tactical unit.

SECTION III

RAILWAY ARTILLERY UNITS

■ 20. GENERAL.—Railway artillery is organized into regiments, battalions, and gun or mortar batteries for purposes of administration, training, and to facilitate its tactical employment. Tables of Organization prescribe in detail the organization of each unit.

■ 21. REGIMENT (T/O 4-41 and 4-51).—*a.* The railway artillery regiment consists of a headquarters and headquarters battery, a band, a service battery, two battalions in time of peace and three in time of war, with medical personnel and a chaplain attached. There are two types of railway artillery regiments differing from each other only in the organization of the batteries. One type of regiment has as primary armament either 12-inch or 14-inch guns, while the other type mans any other kind of railway artillery. The railway regiment is a complete military organization composed of command, combat, and service elements, and is completely equipped with primary armament and fire-control apparatus. It is a tactical and an administrative unit.

b. Regimental headquarters (T/O 4-42) consists of the regimental commander and a staff composed of the executive, adjutant, intelligence officer, plans and training officer, gas officer, supply officer, communication officer, reconnaissance

officer, and railway and munitions officer. At peace strength only six officers are assigned to the staff, the staff duties being combined as directed by the regimental commander.

c. *Regimental headquarters battery* (T/O 4-42) is organized and functions in a manner similar to the tractor-drawn brigade headquarters battery (par. 16c).

d. The *service battery* (T/O 4-43) is organized and functions in a manner similar to the tractor-drawn regimental service battery (par. 17d). The principal difference in the organization of these two units is that no transportation is assigned to the railway artillery service battery for transport of supplies. Such transportation as is needed for this purpose must be furnished by higher command.

e. The *band* (T/O 4-41 and 4-51) is commanded by the regimental adjutant and trained by a warrant officer. For details in regard to its organization, duties, and formations, see FM 28-5.

■ 22. BATTALION (T/O 4-45 and 4-55).—a. The railway artillery battalion consists of a headquarters and headquarters battery and two batteries of guns or mortars. As with the regiment there are two types of railway artillery battalions, one having as primary armament either 12-inch or 14-inch guns and the other manning any other kind of railway artillery. The battalion is normally a tactical unit but when detached from the regiment it becomes an administrative unit as well.

b. *Battalion headquarters* (T/O 4-46) consists of the battalion commander and, at war strength, a staff composed of the adjutant, plans and training officer, intelligence officer, communication officer, gas officer, reconnaissance officer, railway and munitions officer, and supply officer. At peace strength only four officers are assigned to the staff and staff duties are combined as directed by the battalion commander.

c. *Battalion headquarters battery* (T/O 4-46) is organized and functions in a manner similar to that of other headquarters batteries. It contains a railway and munitions detail not found in corresponding tractor-drawn organization. This detail performs the duties assigned to the tractor-drawn ammunition train (par. 18d) and in addition is in charge of rail movements of the battalion.

■ 23. GUN OR MORTAR BATTERY (T/O 4-47 and 4-57).—The railway artillery gun or mortar battery consists of a battery headquarters containing a command detail, range section, and communication section; a firing section containing a gun section for each gun or mortar and a machine-gun and executive officer's detail; and a maintenance section. Railway artillery gun or mortar batteries are of two types, one manning two 12-inch or 14-inch guns and the other manning four guns or mortars of any other type. The battery is an administrative, technical, and under unusual conditions a tactical unit.

CHAPTER 3

ORGANIZATION OF COASTAL FRONTIER DEFENSE

■ 24. **DEFINITION.**—*a.* Coastal frontier defense is the employment of the forces and matériel of the Army and Navy assigned to provide security for the coastal frontiers of continental United States and its oversea possessions.

b. The means provided for this defense may include any elements of the Army and the Navy. The matter contained in this chapter will be limited to that pertaining only to general organization of elements of the Army with particular reference to its bearing upon tactical organization of seacoast artillery.

c. The coastal frontier defense is a wartime organization. During peacetime control of the Regular Army elements that might be assigned to coastal frontier defense is the responsibility of corps area and department commanders, and for seacoast artillery organizations of coast artillery district commanders.

■ 25. **ORGANIZATION.**—The coastal frontier defense is organized into coastal frontiers, sectors, and subsectors (see fig. 2).

■ 26. **COASTAL FRONTIER.**—*a. Definition.*—A coastal frontier is a geographical subdivision of our coastal area established for organization and command purposes. In continental United States each coastal frontier is included as part of an army area. Coastal frontiers may be subdivided for command purposes into sectors and subsectors.

b. Composition.—A coastal frontier is composed of a headquarters consisting of the coastal frontier commander, a general staff, a special staff, and a signal section; a headquarters company; and such troops as may be assigned.

c. Commander.—The coastal frontier commander is responsible for defense of his coastal frontier. He functions under the commander of the army in the area in which the coastal frontier is included as long as the army com-

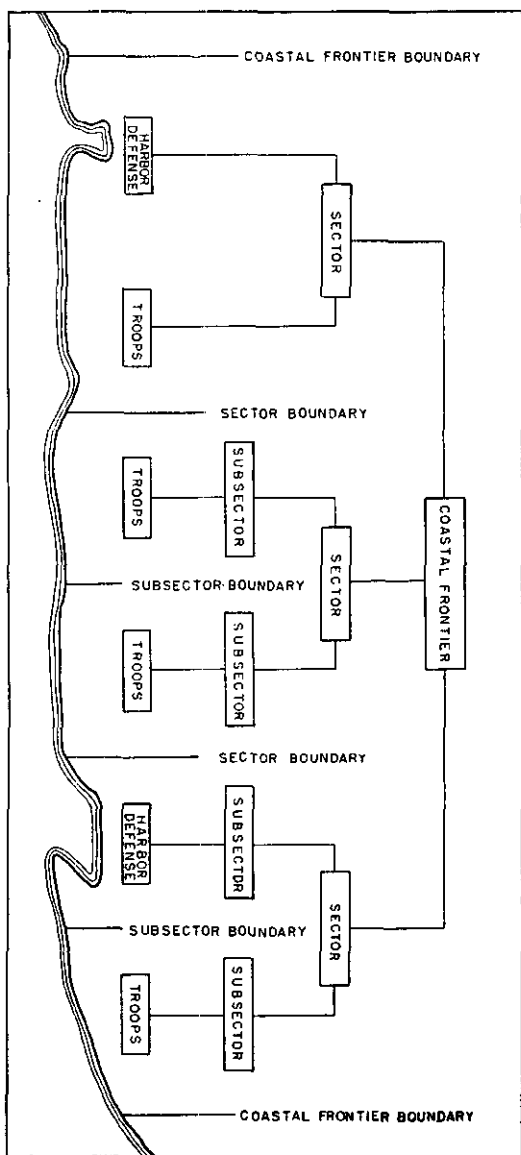


FIGURE 2.—Organization of coastal frontier (schematic).

NOTE.—“Troops” include all troops regardless of arm or service not assigned to harbor defenses, and may or may not include seacoast or antiaircraft artillery units.

mander retains tactical responsibility within the army area. At other times he functions directly under the commanding general of the field forces.

d. Staff.—The coastal frontier staff is organized in a manner similar to that found in divisions and higher units (FM 101-5) but contains the following additional sections:

(1) *Liaison*, containing three general staff officers and their enlisted assistants. This section functions on continuous liaison duty at the headquarters of the naval forces operating in the coastal frontier.

(2) *Artillery*, consisting of two coast artillery officers, one of them being an antiaircraft officer, and their enlisted assistants.

■ 27. SECTOR.—*a.* Because of the large extent of a coastal frontier command it is divided into smaller commands termed sectors. Each sector commander is responsible to his coastal frontier commander for defense of that part of the coastal frontier within his sector.

b. The sector is composed of a headquarters consisting of the sector commander, a small staff, and a liaison detail to function at naval district headquarters; a headquarters company; and such troops as may be assigned.

■ 28. SUBSECTOR.—Because of their large extent it is necessary to divide some sectors into smaller commands termed subsectors. All sectors are not so divided. When subsectors are organized each subsector commander is responsible to his sector commander for the defense of that part of the coastal frontier within his subsector. The subsector is composed of the subsector commander, a staff composed of such members as are necessary and are available, and such troops as may be assigned.

■ 29. TACTICAL CHAIN OF COMMAND.—The tactical chain of command for coastal frontier defense is the commanding general of field forces, the army commander (while he retains tactical responsibility within the army area), the coastal frontier commander, the sector commander, the subsector commander (when subsectors are provided).

■ 30. SEACOAST ARTILLERY TROOPS.—*a. Peace.*—Under peacetime conditions all Regular Army seacoast artillery troops

within the continental United States are stationed in harbor defenses. In each corps area containing harbor defenses a coast artillery district is established. The coast artillery district commander is responsible to the corps area commander for the discipline and training of all coast artillery troops in the corps area.

b. War.—When coastal frontier, sector, and subsector commands come into active existence the coast artillery district commander may become either a coastal frontier or sector commander and all coast artillery troops, including the district staff, become part of the particular subsector (if organized), sector, and coastal frontier command in which they are located.

■ 31. HARBOR DEFENSE.—*a.* A harbor defense is a highly organized and permanently defended locality provided for the general purpose of protecting an important coastal area (seaport, naval base, or anchorage) and utilities, primarily against attack from the sea.

b. When the coastal frontier organization comes into active existence harbor defenses become elements of the defensive organization of the subsector or sector in which they are located and operate under subsector or sector control.

CHAPTER 4

ORGANIZATION OF HARBOR DEFENSE

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SECTION I

HARBOR DEFENSE

■ 32. **DEFINITION.**—A harbor defense is an administrative and tactical command provided for defense of a harbor or other water area (see par. 31).

■ 33. **COMPOSITION.**—*a.* A harbor defense is composed of one or more coast artillery forts in which are located all personnel and matériel provided for its administrative, technical, and tactical functions.

b. Defensive elements of a harbor defense may include fixed and mobile seacoast artillery, antiaircraft artillery, and searchlights; controlled submarine mines; underwater listening posts; subaqueous sound-ranging system; observation and fire-control systems; harbor patrol boats; supporting aircraft; and personnel for manning same.

c. Other elements consisting of both personnel and matériel are provided for administration, supply, training, and tactical employment of the harbor defense.

d. Troops.—(1) Harbor defense units are assigned to harbor defenses to man fixed armament and submarine mines.

(2) Troops from one or more of the administrative, supply, and technical services are assigned to harbor defenses to complete the service element of the command.

(3) Mobile seacoast artillery units may be assigned to harbor defenses to reinforce fixed artillery.

(4) Antiaircraft artillery units and troops from other arms may be attached to a harbor defense.

■ 34. ESTABLISHMENT.—*a. Under peace conditions* harbor defenses are established, their limits defined, their headquarters designated, and personnel allotted or assigned thereto in orders or instructions from the War Department.

b. Under war conditions a harbor defense may be considerably reinforced by mobile seacoast artillery units. These elements will not necessarily be confined in their locations to peacetime territorial limits of the harbor defense, but will be emplaced so that their fire will support or supplement fire of fixed armament.

■ 35. DESIGNATION.—Harbor defenses are designated by the name of the harbor or water area which they defend, or by the name of a prominent city or locality in their immediate vicinity, for example, "the Harbor Defenses of Chesapeake Bay"; "the Harbor Defenses of San Francisco."

■ 36. HARBOR DEFENSE COMMANDER.—The senior Coast Artillery Corps officer present for duty in a harbor defense is the harbor defense commander unless otherwise ordered by the War Department. The harbor defense commander is responsible to the next higher commander for the efficiency of his harbor defense and subject to his authority has control within limits of his command of all matters relating to personnel and matériel, including all funds and property located therein. The harbor defense commander is thus both an administrative and a tactical commander.

■ 37. DUTIES AND RESPONSIBILITIES OF HARBOR DEFENSE COMMANDER.—*a. Administrative responsibilities.*—The harbor defense commander is responsible for all administrative functions of the harbor defense. As is normally the case, when the harbor defense commander is the senior line officer on duty at the fort containing his headquarters, he is also charged with the administrative functions of a post commander as prescribed in AR 210-10. He is advised and assisted in the performance of his administrative duties by members of his staff.

b. Technical responsibilities.—Technical responsibilities of the harbor defense commander extend to all activities and installations of a technical nature within the harbor defense. He is responsible for maintenance of the harbor defense

armament in conformity with its status classification and for serviceable condition of all auxiliary apparatus and equipment pertaining to the harbor defense. He coordinates activities pertaining to the several technical services and makes appropriate decisions in cases of conflict of responsibility. He is advised and assisted in performance of his technical duties by members of his staff.

c. Tactical responsibilities.—The harbor defense commander is responsible for training and control of all seaward, landward, and antiaircraft defense with which the harbor defense is charged. In some cases this may include the entire land and antiaircraft defense of the harbor defense, while in other cases either or both may be provided by agencies not under his control. He is assisted in performance of his tactical duties by his staff. Among the more important of his tactical duties are the following:

(1) Based upon instructions from higher authority he prepares defense projects and plans for the harbor defense.

(2) He prepares all plans for mobilization of the harbor defense, reconstitution of inactive units, and expansion and recruitment necessary to bring personnel of his command up to war strength, including plans for such matters as assignments, quartering, hospitalization, or evacuation incident to expansion. These administrative details may be included in the harbor defense plan or project.

(3) He organizes the armament of his command into such groupments and groups as will best facilitate fire direction and control and insure its effectiveness.

(4) He assigns troops to groupments, groups, and batteries in accordance with his tactical plan.

(5) He assigns officers of his command to appropriate station and duties. In assignment of troops and officers, he makes every attempt to assign a complete organization to a tactical subdivision in order that troops may function under their normal commander and that the commander may be assisted by his normal staff.

(6) He prepares or causes to be prepared charts in sufficient number and detail to show for each tactical unit of the harbor defense the area of zones covered by fire, concentrations of fire possible in any part of the water and land

area covered and, where appropriate, areas within which naval vessels of various types may be attacked with destructive effect.

(7) He issues orders and instructions and conducts drills and exercises necessary to insure that in event of interruption of communications subordinate commanders will conduct action of their units in accordance with the defense plan of the harbor defense.

(8) He keeps subordinate commanders informed at all times as to type of action that reasonably may be expected, and as to any other matters that have a bearing on employment of subordinate units.

(9) During action he exercises control over the action of all elements of the harbor defense. The extent to which he will be able to exercise the functions of fire direction will depend to some extent upon the organization of the harbor defense.

■ **38. HARBOR DEFENSE STAFF.**—*a. General.*—The general duties to be performed by members of the harbor defense staff are the same in all harbor defenses and are described in chapter 6. The number of officers that must be assigned to perform these staff duties will vary in different harbor defenses depending upon such factors as size of the harbor defense, tactical and administrative organization and situation, and number of officers available for assignment.

b. Organization.—The harbor defense commander organizes his staff using as a nucleus the staff of the regiment or separate battalion which he commands and the commanding officers of the service detachments on duty in the harbor defense. Additional members, when necessary, may be detailed from other organizations assigned to the harbor defense. A complete staff should not be organized at the expense of the efficiency of the combat units. Such consolidation of duties and consequent reduction in the number of staff officers will be made as considerations of efficiency and available personnel require.

■ **39. HARBOR DEFENSE SECTION.**—*a. Composition.*—The harbor defense section is composed of the enlisted personnel necessary to assist the harbor defense commander and his

staff in the exercise of their tactical, technical, and administrative functions.

b. Source and organization.—The harbor defense section is obtained from the regimental or separate battalion headquarters battery. It is organized into an administrative section containing headquarters, supply, and maintenance details; a technical section containing artillery engineer, searchlight (only when the harbor defense is manned by a separate battalion), and communication details; and a tactical section containing intelligence, plans and training, and command post details. Personnel to assist staff officers commanding service detachments are furnished by those detachments and are not part of the harbor defense section.

c. Command.—The specialized training and functioning of each detail of the harbor defense section is the responsibility of the staff officer under whom the detail functions. Administration and other than specialized training is the responsibility of the commander of headquarters battery.

■ 40. TACTICAL ORGANIZATION OF HARBOR DEFENSE.—*a. Purpose.*—The harbor defense is organized tactically in order that during combat it may function efficiently under control of the harbor defense commander in accomplishment of its mission as a combat team. This purpose insofar as the coast defense mission is concerned is accomplished by correct choice of armament to be manned when insufficient personnel is assigned to a harbor defense to man all of the armament; by so siting attached mobile artillery as to best reinforce the harbor defense armament; and by providing means for directing fire of this armament in such a manner as to obtain maximum fire effect.

b. Antiaircraft artillery.—Within a harbor defense all antiaircraft artillery will normally be grouped into an antiaircraft groupment or separate group. Tactical organization and functioning of this groupment or group is similar to that of an antiaircraft regiment or battalion and will not be discussed in this field manual. (See FM 4-105.)

c. Armament to be manned.—In planning tactical organization of the harbor defense, the commander must first make a decision as to armament to be manned and siting of any

attached mobile artillery. In arriving at this decision the following points should be considered:

- (1) Mission of harbor defense.
- (2) Capabilities of enemy.
- (3) Amount of armament available together with its characteristics (rate, volume, and fields of fire, and destructive effect).
- (4) Position-finding equipment available.
- (5) Probable reinforcing artillery to arrive at a later date.
- (6) Personnel available for assignment with reference to its strength, organization, and condition of training.
- (7) Reinforcing artillery personnel to arrive at a later date.
- (8) Time available for occupation of positions.

d. Fire direction is the exercise of tactical command over one or more units with a view to concentrating or distributing fire upon the proper targets at the appropriate time. The organization established to provide fire direction is a tactical organization and should satisfy the following requirements:

- (1) No one commander must be placed in command of more subordinate units than he can control efficiently. The number of units which can be assigned to one commander is considered to be between two and five depending upon the complexity of the duty that is to be performed.

- (2) All of the units operating together as a team to accomplish a common purpose should be grouped under the same commander. This requirement dictates that the tactical organization be based upon fields of fire and hitting power of batteries rather than upon their actual location.

- (3) Tactical organization must be as simple as is consistent with the demands for effective control.

- (4) Tactical organization must never be so complex that the available communication net is inadequate to serve its needs.

e. Tactical subdivisions into which the harbor defense may be divided are groupment, group, and battery. Any of these subdivisions except the battery may be omitted, tactical organization depending entirely upon the local situation.

f. Tactical chain of command corresponds to tactical organization and may in general be harbor defense, group-

ment, group, battery. Any or all of the echelons between the harbor defense and the battery may be omitted.

g. Emergency tactical organization.—An emergency may occur in which normal tactical organization of the harbor defense will cease to function effectively. The possibility of such an occurrence must be foreseen and emergency tactical organizations must be prearranged. Tactical reorganization may be required because of either of the two following types of emergency:

(1) *Disruption of some part of communication system.*—Since fire direction is dependent on communication, plans must be made and orders published to rearrange automatically tactical organization upon severance of any part of the communication system. This type of organization may require that any unit function as an independent command, and that units normally functioning under one commander function under a different commander. Insofar as possible, the emergency plan should permit command echelons to continue to perform their normal functions by logical reassignment of units to commands, and retain to the greatest possible extent normal chains of command. In general, the reassignment of units must be based upon their location to a much greater degree than was necessary in their original assignment.

(2) *Defense against land or landing attacks.*—Normal tactical organization of the harbor defense is made for the purpose of providing effective teams for attack of enemy naval vessels, location of defense elements being of secondary importance. If a land or landing attack is made against an area and the attack is of such nature as to endanger seriously existence of vital installations, it will be necessary to use as a team all or part of the troops in that area to repulse the attack. Since normal tactical organization will generally find units of one command widely separated, it is necessary that an emergency organization be provided for defense against this type of attack. The fort commander, who is an area commander, can be charged logically with this duty. He is held responsible under the harbor defense commander and in accordance with harbor defense plans

for organization and tactical control of all elements located at or attached to his fort in defense of the fort against ground attacks. For this organization the chain of command is harbor defense, fort, such subdivisions as the fort commander may organize (provisional regiments or battalions), battery. The senior coast artillery officer on duty is the fort commander and usually will be a groupment or group commander.

■ 41. ADMINISTRATIVE ORGANIZATION OF HARBOR DEFENSE.—*a. Purpose.*—Administrative organization of the harbor defense is provided for the purpose of facilitating administration, supply, and technical control of personnel and matériel located therein. This purpose can be accomplished most efficiently by an organization which places all of the personnel and matériel located in the same area under the same commander.

b. Harbor defense administrative situation.—The tactical organization of the harbor defense, being based on fields of fire of batteries rather than on their location, cannot be used for administration and supply without introducing undesirable complications. Since all of the elements of a harbor defense are located in one or more areas termed forts, the fort is the logical principal administrative subdivision of the harbor defense, with the batteries located therein the basic subdivisions. Administration, supply, and technical control is not so complicated as to require intermediate echelons between fort and battery. However, since the regimental or separate battalion commander assigned to a harbor defense is charged with administration of his unit, all correspondence pertaining to personnel or matériel of his organization normally will pass through his headquarters in addition to those of the appropriate harbor defense administrative echelons.

c. The administrative chain of command of a harbor defense is therefore harbor defense, regiment or separate battalion (only for matters pertaining to personnel or matériel of that command), fort, battery.

d. Regimental and battalion commanders usually will be groupment or group commanders and fort commanders. It is advantageous that administrative and tactical responsibilities rest in the same persons.

SECTION II

BATTERY

■ 42. DEFINITION.—*a.* The battery is the basic combat unit of the harbor defense.

b. The *gun (howitzer or mortar) battery* consists of one or more guns (howitzers or mortars), fixed or mobile, of the same caliber and characteristics employed against a single target at a time, together with all structures, equipment, and personnel necessary for their emplacement (in case of mobile weapons), and service.

c. The *mine battery* consists of the personnel, structures, and equipment other than mine planters and auxiliary boats necessary for installation, operation, and maintenance of all or part of the controlled mine fields. Personnel of the mine battery operate and maintain distribution box boats, motor mine yawls, and rowing mine yawls. The mine group commander is in charge of these boats or designates an officer under his command for that duty. The planting section of the mine planter is part of the mine battery. The mine planter is operated by the mine planter detachment and not by the mine battery.

d. The *searchlight battery* consists of the personnel, matériel, equipment, and structures necessary for emplacement (in case of mobile searchlights), operation, and maintenance of all searchlights, seacoast or antiaircraft, normally assigned to a harbor defense.

■ 43. TACTICAL EMPLOYMENT.—*a.* The battery normally functions with one or more other batteries as a group under a group commander. When so employed the battery commander is responsible for conduct of fire of his battery.

b. Under unusual conditions a battery may function as a tactical unit with the battery commander charged with fire direction as well as with conduct of fire. This condition may be brought about in one of three ways:

(1) *Designation of the battery as a separate battery* may be made if the battery is far removed from other like armament, covers part or all of a water area that is not covered by other like armament, or is composed of weapons that a higher commander desires to retain under his direct control. A separate battery may function directly under the harbor

defense or groupment commander. Fire direction of such a battery may be exercised by the commander under whom it functions or, exceptionally, it may be charged to the battery commander.

(2) In case of *interruption of communication with higher units*, the battery must continue to function with the battery commander responsible for its fire direction (see par. 40g). Under these circumstances and in the absence of instructions to the contrary, the battery commander is charged with opening fire on any target appearing in his field of a class suited to his armament.

(3) *When direction of fire is released to the battery commander* by the order, BATTERY COMMANDER'S ACTION. The necessity for this action is caused only by some emergency such as unreliable communication, restricted visibility, or rapidity of action which renders the group or other commander unable to perform effectively his normal function of fire direction. Before taking this action, the group or higher commander should give serious consideration to the possible results of the loss of this most important tactical control.

SECTION III

GROUP

■ 44. DEFINITION.—*a.* The group is a tactical unit of the harbor defense formed for the purpose of fire direction.

b. The *gun group* is a tactical unit composed of two or more gun (howitzer or mortar) batteries, mobile or fixed, whose weapons are suited for employment against the same or similar targets, and whose normal fields of fire cover the same general water area, together with personnel and installations necessary for employment of the group as a unit.

c. The *mine group* is a tactical unit composed of the personnel, submarine mine matériel, structures, vessels, and armament necessary to plant, operate, maintain, and protect part or all of the controlled mine fields of a harbor defense. It is also an administrative and supply unit in respect to mine property.

■ 45. DESIGNATION.—The harbor defense commander designates the groups of the harbor defense by number serially beginning with 1, for example, Group 1, Group 2.

■ 46. ORGANIZATION.—The group is composed of a headquarters consisting of the group commander and his staff, a group section, and two or more batteries. A harbor defense battalion with such batteries attached or detached as the tactical organization requires is normally assigned to the group.

■ 47. GROUP COMMANDER.—a. The group commander is normally the commander of the battalion assigned to the group. He is responsible for training and for tactical and technical control of elements assigned to his group. The mine group commander also has administrative duties in respect to supply of mine property.

b. Among the more important *tactical duties* of the group commander are the following:

(1) He supervises all measures taken by elements of his group to provide local security, including construction of field fortifications, camouflage and concealment, defense against chemical attack, defense against mechanized attack, and antiaircraft defense, and makes certain that such measures are coordinated with similar measures taken by adjacent units.

(2) He directs action of such searchlights as are assigned to his group.

(3) He is responsible for fire direction of his group.

(4) He exercises close supervision over ammunition expenditure and supply, and initiates action necessary to replenish ammunition expended and to maintain required reserve with each of his batteries.

(5) Under emergency tactical organization of the harbor defense, he may be required to function as a groupment commander.

■ 48. GROUP STAFF.—The group staff consists of an intelligence and plans and training officer, a communication and searchlight officer, a gas officer, and in a mine group a mine property officer. The duties performed by the staff are described in chapter 6. Under certain conditions staff duties may be consolidated and the number of staff officers reduced. Under other conditions additional staff officers may be required, the size of the staff always being kept to a min-

imum. The staff is normally obtained from the headquarters of the battalion assigned to the group.

■ 49. GROUP SECTION.—The group section consists of the enlisted personnel necessary to assist the group commander and his staff in exercise of their tactical, technical, and training functions, and in a mine group a mine property detail. Organization and duties where applicable are similar to those of the harbor defense section (par. 39). Personnel of this section are provided by appropriate battalion headquarters batteries.

■ 50. TACTICAL CONSIDERATIONS AFFECTING GROUP ORGANIZATION.—*a. Purpose.*—Groups are organized in order that when enemy naval vessels enter a field of fire common to two or more batteries the weapons of which are suited for employment against the same types of vessels, a single commander (group commander) may be responsible for fire direction of all these batteries. Accomplishment of this purpose requires that—

(1) Batteries of a group should as far as practicable contain the same type and caliber of armament. Minimum requirement in this respect should be suitability of all armament of the group for fire on the same types of naval targets.

(2) Fields of fire of the batteries of the group should cover the same general water area.

(3) Number of batteries included in one group should not exceed the number that one commander can control (see par. 40*d*(1)).

b. Location of elements.—Effective fire direction is the primary purpose of the organization of the group but location of elements of the group also must be considered.

(1) The group command post should overlook the water area covered by fire of the group.

(2) Since the group commander is charged with technical and training functions and with supervision of local security measures within his group, it is desirable that elements of the group be located near each other. This will not always be practicable, particularly with long range batteries which may be separated by several miles.

c. Separate groups.—While the group normally functions as part of a groupment, certain situations may arise in which it is advisable to designate it as a separate group to function directly under a higher commander. Such a situation may arise in any of the following ways.

(1) A group may be so far removed from other armament that its inclusion in a groupment is impracticable because of communication or other difficulties.

(2) Armament of a group may cover a separate water area not under control of any groupment.

(3) A group may be composed of weapons which a higher commander desires to retain under his direct control.

SECTION IV

GROUPMENT

■ 51. **DEFINITION.**—A groupment is a tactical command containing two or more groups or separate batteries whose fields of fire cover a certain water area, together with personnel and matériel required for its employment as a unit. A portion of the water area of one groupment may be covered by batteries of another groupment.

■ 52. **DESIGNATION.**—The harbor defense commander designates a groupment by the name of some geographical feature with which the groupment is by mission or location identified, for example, Hampton Roads Groupment, Monterey Groupment.

■ 53. **ORGANIZATION.**—The groupment is composed of a headquarters consisting of the groupment commander and his staff, a groupment section, and two or more groups. Separate batteries may also be included in the groupment.

■ 54. **GROUPMENT COMMANDER.**—*a.* The groupment commander is responsible for fire direction of his groupment. He exercises technical, training, and tactical functions with respect to personnel and matériel of his groupment similar to those exercised by the harbor defense commander with respect to the harbor defense.

b. In a harbor defense consisting of but one groupment, designation of groupment is dispensed with, and the harbor

defense commander performs functions normally charged to a groupment commander.

■ 55. **GROUPMENT STAFF.**—*a. Composition.*—The groupment commander organizes his staff from officers available. The staff normally consists of a plans and training officer, an intelligence officer, a communication officer, a searchlight officer, and a gas officer. Functions of the groupment staff with respect to groupment are similar to those of the harbor defense tactical staff with respect to the harbor defense; duties of staff officers are as described in chapter 6. If a harbor defense commander is also the groupment commander his tactical staff functions as the groupment staff.

b. Restriction on size.—The number of staff officers required in a groupment will depend upon local conditions. Where practicable staff duties should be consolidated and the number of staff officers reduced. In case a groupment commander is also a harbor defense or fort commander, he should make such consolidations of harbor defense or fort and groupment staff duties as are appropriate (see par. 41*d*).

■ 56. **GROUPMENT SECTION.**—The groupment section consists of the enlisted personnel necessary to assist the groupment commander and his staff in the exercise of their tactical, technical, and training functions. Personnel of this section are furnished by appropriate regimental or battalion headquarters batteries, or when the harbor defense commander is the groupment commander by the harbor defense section. Its organization and duties, where applicable, are similar to those of the harbor defense section (par. 39).

■ 57. **TACTICAL CONSIDERATIONS AFFECTING GROUPMENT ORGANIZATION.**—*a. Purpose.*—Groupments are organized in order to facilitate tactical control of units functioning in the harbor defense when the number of such units is greater than can be controlled effectively by the harbor defense commander or geographical location of certain elements renders such control impracticable.

b. Requirements.—Effective accomplishment of the purpose for which groupments are organized requires that assignment of units be such that—

(1) Each groupment may be given a definite responsibility in regard to the part it is to play in defense.

(2) Possible conflicts in responsibilities given to groupments may be reduced to a minimum.

c. Accomplishment of purpose for which groupments are organized may be attained in several ways:

(1) Groupments may be organized in such manner that all groups or separate batteries whose normal fields of fire are included in a definite water area are assigned to the same groupment. Using this method of organization, the water area defended by the groupment should be a distinct, separate water area separated from other defended water areas by—

(a) Some obstacle to navigation.

(b) Water area not covered by normal fields of fire of harbor defense armament other than that of a separate group or battery functioning under the harbor defense commander.

(c) Some natural feature such as a harbor entrance.

The advantage of this method of organization is that during the entire time enemy naval vessels are operating in a defended water area, a single commander may direct and coordinate fire of all harbor defense weapons functioning in that area. When the number of units that would be included in the groupment is greater than one individual can control effectively, or when for some other reason the preceding method of organization is impracticable, one of the methods in (2) and (3) below may be used.

(2) Groups and separate batteries that would otherwise be placed in one groupment may be divided by placing all primary armament in one groupment and all secondary armament in another groupment. Thus direction of fire against naval targets suitable for primary armament will be the responsibility of one groupment commander while direction of fire against other targets will be that of another commander.

(3) Units, the normal fields of fire of which are included in the same defended water area, may be so widely separated as to make advisable their division into separate groupments based upon their geographical location. In this case positive action must be taken by the harbor defense commander to

insure coordination of action against targets in that part of the defended water area in which groupment fields of fire overlap.

SECTION V

FORT

■ 58. DEFINITION.—*a.* A fort is a land area within a harbor defense wherein are located harbor defense elements.

b. The fort is organized primarily as an administrative command designed to provide centralized control over administrative and technical details pertaining to personnel and matériel located therein. Under certain circumstances it is employed as a tactical unit and its organization must provide for such employment.

■ 59. COMPOSITION.—*a.* Composition of a fort varies with local conditions and is not prescribed. Any of the elements included in the harbor defense (par. 33) may be located in the fort. The fort may contain all or part of one or more tactical commands.

b. Amount, types, and calibers of armament, submarine mine installations, and auxiliary installations and equipment at a fort depend chiefly upon location of the fort with reference to zones and areas defended by the harbor defense of which it is a part. All seaward defenses of a harbor may be contained in a single fort or they may be distributed among several forts.

■ 60. ESTABLISHMENT.—*a.* Under peace conditions territorial limits of forts are established and defined by War Department orders.

b. Under war conditions armament of a fort may be augmented by mobile units, location of which will not necessarily be confined to defined peacetime limits of the fort.

■ 61. ORGANIZATION.—The fort is composed of a headquarters consisting of the fort commander and his staff, a fort section, and such tactical and technical units as may be assigned to it.

■ 62. FORT COMMANDER.—The senior Coast Artillery Corps officer present for duty in a fort is the fort commander except that in a harbor defense consisting of more than one fort, the harbor defense commander may designate the next senior

officer, exclusive of his staff, to act in this capacity at the fort where the harbor defense headquarters is located.

■ 63. DUTIES OF FORT COMMANDER.—*a.* The fort commander is responsible to the harbor defense commander for all matters affecting administration of his command. When the fort commander is the senior line officer on duty at the fort he is also charged with the administrative functions of a post commander. (See AR 90-50 and AR 210-10.)

b. While the fort commander as such is not included in the tactical chain of command of the harbor defense, he must so organize elements of the fort as to permit them to function as a tactical unit under his command under either of two emergency conditions (see par. 40*g*):

(1) Upon disruption of communication with the harbor defense.

(2) In event of a land or landing attack against the fort that seriously endangers vital harbor defense installations.

c. In addition to his duties in connection with the fort, the fort commander will normally serve as a groupment or group commander in harbor defense tactical organization. His command post should be located in the fort which he commands.

■ 64. FORT STAFF.—*a.* The normal fort staff is an administrative staff only and consists of the adjutant, the artillery engineer, the ordnance officer, the quartermaster, and the surgeon. This staff is organized by the fort commander from officers available or assigned for that purpose. Such consolidation of duties and consequent reduction in the number of officers will be made as considerations of efficiency and available personnel require. Duties of members of the fort staff are described in chapter 6.

b. For emergency tactical operations of the fort, the fort commander organizes a tactical staff from available officers. He normally will utilize for this purpose the staff of the groupment or group that he commands.

■ 65. FORT SECTION.—The fort section is organized by the fort commander from personnel available or assigned for that purpose. Its organization and duties, where applicable, are similar to those of the harbor defense section (par. 39).

CHAPTER 5

TACTICAL ORGANIZATION OF MOBILE SEACOAST ARTILLERY

■ 66. ASSIGNMENT.—*a.* In time of peace all Regular Army mobile seacoast artillery units within the continental United States are assigned to harbor defenses.

b. Under war conditions some or all mobile seacoast artillery units may be assigned to organizations of the coastal frontier defense outside the harbor defense. They may be assigned by brigade (tractor-drawn artillery only), regiment, battalion, or, exceptionally, by battery.

■ 67. EMPLOYMENT.—*a.* *Within the harbor defense* mobile seacoast artillery is employed in a manner similar to that in which fixed armament of like caliber is employed.

b. *Outside the harbor defense* mobile seacoast artillery may be employed in considerable quantity in establishment of temporary harbor defenses for harbors not defended by fixed armament or in defense of important beaches, or it may be widely scattered in defending a number of beaches. Normally it functions under control of the subsector commander or under the sector commander when subsectors are not organized, but its control may be retained by a higher commander.

■ 68. TACTICAL ORGANIZATION WITHIN HARBOR DEFENSE.—When assigned to harbor defenses mobile seacoast artillery units are absorbed in the harbor defense organization and become integral parts of that command, functioning in exactly the same manner as do fixed seacoast artillery units. Battalion and regimental commanders are given appropriate assignments as group and groupment commanders.

■ 69. TACTICAL ORGANIZATION OUTSIDE THE HARBOR DEFENSE.—*a.* *Tactical control* of seacoast artillery units assigned to the coastal frontier is normally decentralized to the subsector (sector when subsectors are not organized). Such control

and coordination as higher commanders must exercise is conducted through the normal coastal frontier chain of command, no strictly artillery chain of command existing for this purpose. Control within the subsector is dependent on tactical organization therein.

b. *Tactical organization* of mobile seacoast artillery within the subsector (sector) depends upon local conditions and is not prescribed. Batteries may be formed into groups, groups into groupments, and temporary harbor defenses may be organized all in a similar manner to that used in fixed harbor defense. The subsector (sector) commander may personally control operations of seacoast artillery, he may appoint an officer to function under him as commander of all or part of it, or under unusual circumstances he may further decentralize control by attaching units to organizations which they support.

CHAPTER 6

DUTIES OF SEACOAST ARTILLERY STAFF OFFICERS

	Paragraphs
SECTION I. General.....	70-73
II. Staff.....	74-92

SECTION I

GENERAL

■ 70. PURPOSE OF STAFF.—A staff is provided to assist the commander in the exercise of those functions with which he is charged. The number of officers in a staff depends therefore upon the number and complexity of these functions. A staff while kept to a minimum should be sufficiently large to relieve the commander of the burden of details and allow him time for consideration of broader phases of his duties. Functioning of a staff and details usually charged to each member are discussed in FM 101-5. Discussion in this chapter will be confined to description of the general duties of seacoast artillery staff officers with particular reference to those duties peculiar to seacoast artillery.

■ 71. EFFECT OF TACTICAL ORGANIZATION.—Staffs of seacoast artillery brigades (tractor-drawn only) regiments, and battalions are prescribed in Tables of Organization. Tactical employment of seacoast artillery frequently will be such that none of these organizations will be employed as tactical units, tactical control being maintained by formation of groups, groupments, and harbor defenses, and brigade, regimental, and battalion commanders will be assigned to appropriate tactical commands. The staff assigned by Tables of Organization to the commander normally will function as his staff in the tactical command to which he is assigned. Reallotment of the duties of staff officers or detail of additional staff officers may be required under certain tactical situations.

■ 72. DUTIES OF STAFF OFFICERS.—The allotment of duties to staff officers shown herein is that normally employed but may be changed as the commander desires. The staff is assigned to assist the commander. Employment of the staff to provide the most efficient assistance possible is the responsibility of the commander.

■ 73. CONSOLIDATION OF STAFF DUTIES.—Such consolidation of staff duties with consequent reduction in the number of staff officers should be made as considerations of efficiency and personnel will permit.

SECTION II

STAFF

■ 74. GENERAL.—The staff of a seacoast artillery command is composed of such of the staff officers listed in this section as are required for efficient operation of the organization, the number required depending upon size and type of the command and its tactical employment. In a large command it may be necessary to provide assistants to one or more of the staff officers, while in small commands one officer may be able to handle the details otherwise charged to two or more officers.

■ 75. EXECUTIVE.—The executive is the principal assistant and adviser of the commander. He keeps the commander informed in regard to all matters affecting efficiency of the command. He obtains from the commander basic decisions governing operations of the command, makes such decisions supplementary thereto as are necessary, and allots to the staff the work of preparing plans and orders in accordance with these decisions. He supervises work of the staff, coordinating activities of the staff officers within the staff and with the troops. He reviews all orders before issue, assuring himself that they are in accordance with policies and plans of the commander and by personal observation and through other staff officers sees that they are executed.

■ 76. INTELLIGENCE OFFICER (S-2).—The intelligence officer keeps the commander and the staff informed regarding the

enemy situation. He trains the unit intelligence detail and establishes unit intelligence observation posts, obtains and distributes maps, exercises general supervision over the intelligence service of his unit, maintains liaison with other intelligence services, and supervises counterinformation activities of his unit. He collects, evaluates, and interprets all enemy information received, making timely distribution of essential information to all concerned.

■ 77. PLANS AND TRAINING OFFICER (S-3).—The plans and training officer keeps the commander and the staff informed on all matters pertaining to strength, location, disposition, and condition of the troops of his unit. He is responsible for preparation of plans and orders, and for supervision of all activities concerning mobilization, organization, training, and operations of the unit; for training and functioning of the plans and training detail; and for maintaining liaison with adjacent troops, including those of the Navy.

■ 78. COMMUNICATION OFFICER.—The communication officer advises the commander and the staff on all matters relating to signal communication, including location of command posts. He provides for installation, operation, and maintenance of the unit message center and of temporary communication systems required; for connection of temporary systems to permanent systems; and for operation of unit radio stations. He is responsible for training and functioning of the communication section of his unit, and for supervision and coordination of training and functioning of communication personnel of subordinate units.

■ 79. LIAISON OFFICERS.—Liaison officers may be attached to adjacent or supported units for the purpose of procuring and transmitting promptly such information as is needed to insure effective cooperation. They act as advisers to the commanders of the units to which they are attached on matters concerning seacoast artillery. Such liaison officers as are used by seacoast artillery units will usually be attached to subsector, sector, or naval headquarters.

■ 80. SEARCHLIGHT OFFICER.—The searchlight officer advises the commander and the staff on matters relating to employment of searchlights assigned to the unit. He is responsible

for care, maintenance, and operation of all searchlights, sea-coast or antiaircraft, manned by seacoast artillery personnel, and for training and functioning of personnel manning them. He is responsible for tactical control of all searchlights retained under control of his unit commander. In the harbor defense regiment, he commands the searchlight battery.

■ 81. RECONNAISSANCE OFFICER.—The reconnaissance officer, who is a member of the staff of mobile units only, advises the commander and the staff on topographical matters affecting disposition of the unit. He reconnoiters for routes and positions, establishes and maintains unit observation posts for plotting and spotting, furnishes topographical data to subordinate units, and is responsible for training and functioning of the reconnaissance section.

■ 82. ADJUTANT (S-1).—The adjutant advises the commander and the staff on matters pertaining to personnel of the command when considered as individuals. He is responsible for matters concerning procurement, assignment, promotion, and discharge of personnel, and for all records and reports pertaining thereto. He maintains the office of record for his headquarters. He handles all official correspondence and orders except that pertaining to combat operations. He commands the band when a band is assigned to his unit.

■ 83. SUPPLY OFFICER (S-4).—The supply officer advises the commander and the staff on matters pertaining to supply. He is responsible for general supervision and coordination of all supply activities of the command, procurement and distribution of such supplies as are not charged to some other staff officer, and keeping prescribed records regarding supplies and equipment of his unit. In mobile seacoast artillery units the regimental supply officer commands the service battery, and battalion supply officers command battalion sections therein.

■ 84. ORDNANCE OFFICER.—The ordnance officer, a member of harbor defense and fort staffs only, advises the commander and the staff on matters pertaining to equipment, matériel, and ammunition furnished by the Ordnance Department. He is responsible for procurement, storage, and issue of

ordnance matériel, supplies, and ammunition, and for keeping prescribed records and reports thereon. He supervises all repairs made to ordnance matériel and the use of ordnance supplies. He commands ordnance personnel attached to the command.

■ 85. MUNITIONS OFFICER.—The munitions officer, a member of tractor-drawn seacoast artillery regimental and battalion staffs only, advises the commander and the staff on matters pertaining to supply of ammunition. He is responsible for procurement, storage, and distribution of ammunition, and for keeping ammunition records and reports. In the battalion the munitions officer commands the ammunition train.

■ 86. RAILWAY AND MUNITIONS OFFICER.—The railway and munitions officer, a member of railway seacoast artillery regimental and battalion staffs only, has the same duties in regard to ammunition as has the munitions officer (par. 85). In addition he is responsible for supervision of rail movements of his unit and advises the commander and the staff on matters pertaining thereto. He is responsible for training and functioning of the railway and munitions detail of headquarters battery.

■ 87. ARTILLERY ENGINEER.—The artillery engineer, a member of harbor defense and fort staffs only, advises the commander and the staff on matters pertaining to repair, maintenance, and operation of communication systems, searchlights, power plants, and lines of power distribution. He is responsible for procurement, storage, and issue of engineer and signal corps matériel and supplies, and for keeping prescribed records and reports thereon. He supervises repair, maintenance, and operation of communication systems, searchlights, power plants, and lines of power distribution. He is responsible for training and functioning of the artillery engineer section of headquarters battery.

■ 88. GAS OFFICER.—The gas officer advises the commander and the staff on matters pertaining to defense against chemical warfare. He is responsible for procurement, storage, and issue of chemical warfare protective equipment and supplies, preparation of chemical defense plans, and supervision of chemical warfare defense training and operations.

■ 89. **QUARTERMASTER.**—The quartermaster, a member of harbor defense and fort staffs only, advises the commander and the staff on matters pertaining to the Quartermaster Corps. He is responsible for procurement, storage, and issue of all quartermaster equipment and supplies, including rations; construction, repair, and maintenance of buildings and roads other than those of fortifications; operation and maintenance of road, water, and rail transportation not charged to other officers; and operation and maintenance of any other quartermaster activities such as laundries and motor repair shops that are installed. He commands the quartermaster detachment.

■ 90. **SURGEON.**—The surgeon advises the commander and the staff on matters pertaining to health, sanitation, and evacuation. He is responsible for the health and sanitation of the command, care and disposition of sick and wounded, supervision of training in first-aid and hygiene, and procurement, storage, and issue of medical supplies. He commands the medical detachment.

■ 91. **DISBURSING OFFICER.**—The disbursing officer advises the commander and the staff on fiscal matters. He is responsible for payment of the command and for payment for supplies purchased, labor, and damage or claims. He commands the finance detachment.

■ 92. **CHAPLAIN.**—The chaplain advises the commander and the staff on matters pertaining to religious and moral activities. He is responsible for conduct of religious services and other activities designed to maintain spiritual welfare of the command, spiritual ministrations to sick and wounded, coordination of religious work of welfare agencies, and correspondence with relatives of deceased members of the command.

PART TWO

TACTICS

CHAPTER 7

GENERAL

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SECTION I

COASTAL FRONTIER DEFENSE

■ 93. **MISSION OF SEACOAST ARTILLERY.**—The mission of seacoast artillery in coastal frontier defense is attack of naval vessels by means of artillery fire and controlled submarine mines.

■ 94. **DEFINITIONS.**—To provide a basis of understanding between the Army and Navy in employment of forces in coastal frontier defense, certain terms have been adopted for common use, the more essential of which are defined below.

a. Coastal frontier.—(See par. 26). Within each coastal frontier an Army and a Navy officer will exercise command over all Army forces and Navy forces, respectively, assigned for defense of the coastal frontier. For command purposes, coastal frontiers may be subdivided into sectors and subsectors.

b. Naval districts are military and administrative commands ashore established for the purpose of decentralizing the Navy Department's functions with reference to control of shipping in coastal zones and related shore activities. Limits of these commands approximately coincide with sectors of coastal frontiers.

c. Coast artillery districts are military commands within corps areas which contain harbor defenses. They are estab-

lished for the purpose of decentralizing the corps area commander's functions of discipline, instruction, and routine training of coast artillery troops within the corps area. When frontier commands, sectors, and subsectors come into active existence, coast artillery districts cease to exist and all coast artillery troops, including the district staff, located therein automatically become part of the frontier, sector, or subsector command, as the case may be. The coast artillery district commander automatically becomes a coastal frontier or sector commander.

■ 95. RELATION OF SEACOAST ARTILLERY TO OTHER ARMS.—*a.* Seacoast artillery may act alone, in conjunction with air or naval forces, or as a part of a force of all arms. Against a purely naval attack, seacoast artillery usually acts alone or in conjunction with air or naval forces. In beach defense and in defense of harbors made the object of a determined attack, it will normally act as a part of a force of all arms. Except for air and naval forces, seacoast artillery is the only means capable of attacking all types of hostile ships and is therefore a vital element in coast defense.

b. The relation between seacoast artillery and air and naval forces is particularly close, since they engage in common missions and since the last two forces constitute the most important means through which information concerning enemy naval movements may be obtained.

SECTION II

CHARACTERISTICS OF SEACOAST ARTILLERY

■ 96. DEFINITION AND CLASSIFICATION.—*a.* The term "seacoast artillery" as used in this manual includes all artillery, fixed, tractor-drawn, and railway, employed either within or without a harbor defense, and organized primarily for defense against hostile naval vessels. Submarine mines are a part of seacoast artillery.

b. Seacoast artillery is classified according to caliber as primary and secondary armament. Primary armament, which includes all armament of 12-inch or greater caliber and submarine mines, is employed primarily for the purpose of attacking capital ships; secondary, which includes all

other armament, is used for attack of noncapital, lightly armored, or unarmored ships, and against capital ships to damage the superstructure and reduce effectiveness of fire control.

■ 97. POWERS AND LIMITATIONS.—*a.* Seacoast artillery is characterized by its ability to concentrate quickly great fire power against naval targets, by its ability to shift fire rapidly from one naval target to another, by the long range of its weapons, by the strategical mobility of its mobile armament, and by comparative invulnerability of its weapons to naval artillery fire.

b. Limitations of seacoast artillery are its vulnerability when unsupported to air attacks; to attack by landing parties, particularly in time of low visibility, and to land attacks from the flanks and rear; immobility of the fixed armament; and limited tactical mobility of some of the mobile armament.

■ 98. RELATIVE CHARACTERISTICS OF TYPES OF WEAPONS.—*a.* Chief characteristics of the principal weapons of seacoast artillery are shown in figure 3. Detailed characteristics of all types of weapons are contained in Technical Manuals.

b. Fixed armament.—(1) *Advantages.*—(*a*) Ready for use on short notice.

(*b*) Effective concrete, earth, or armor plate protection may be afforded.

(*c*) Ammunition supply is ordinarily stored in immediate vicinity of the guns.

(*d*) Use of permanently installed communications, stations, and fire-control equipment is practicable.

(*e*) Maximum stability in the mount is attained with resulting accuracy of fire.

(2) *Disadvantages.*—(*a*) *Immobility.*

(*b*) May be difficult or impossible to conceal.

(*c*) Location will probably be known to the enemy.

(3) *Field of fire.*—In much of the fixed armament the field of fire is limited by the construction of either the carriage or the emplacement and the maximum range is small, especially when the disappearing carriage is used, limited by the construction of the carriage.

c. Railway artillery.—(1) *Advantage.*—Ability to move great distances.

(2) *Disadvantages.*—(a) Requires considerable time for emplacement and subsequent movement.

(b) In some types use of previously prepared concrete gun blocks is necessary.

(c) Permanent communications and stations may not be available.

(d) Employment is limited to locations where railway facilities exist.

(e) Protection against air attacks or concealment from air observation is generally difficult to afford.

d. Tractor-drawn artillery.—(1) *Advantages.*—(a) Relative rapid movement, emplacement, and displacement, hence can be used when and where required.

(b) Because of mobility, location to take advantage of natural cover and concealment.

(2) *Disadvantages.*—(a) Use against rapidly moving naval targets may be restricted by limited traverse of the gun on the carriage, except where special emplacements are provided.

(b) Emplacement may require considerable time.

■ 99. PROJECTILES.—*a.* Different type projectiles now furnished for various seacoast artillery weapons are indicated in figure 3. The *armor-piercing* (AP) projectile is designed to penetrate side and deck armor of heavily armored ships, and by use of a delay-action fuze it is intended that the projectile will explode inside the ship where it will do maximum damage. Armor-piercing projectiles for use with primary guns and howitzers are designed to penetrate the heaviest armor when the range and angle of impact are favorable. Mortar (DP) projectiles are designed to penetrate deck armor. In general AP projectiles are not suitable for use against land targets because the bursting charge is relatively much less than in the high explosive shell normally used in land warfare, and the delay-action fuze permits the projectile to bury itself too deeply in the ground before functioning. The common steel high explosive (HE) shells are suitable for land warfare but are also designed with sufficient strength to

penetrate lightly armored ships and secure maximum effect against unarmored ships, superstructure, and personnel.

b. It is planned to retain in use all AP shot and shell and all HE shell now provided for the various weapons, but eventually replace all primary AP shot and shell by a single AP projectile similar to the old AP shot; to provide railway artillery with a proportion of HE shell for use against land targets; to provide star shell for 6-inch and 155-mm guns; and also provide chemical shell for 155-mm guns.

SECTION III

NAVAL VESSELS, CHARACTERISTICS AND FORMATIONS

■ 100. GENERAL.—Naval vessels possess characteristics which give rise to special problems in tactical employment of seacoast artillery. Those charged with tactical employment of seacoast artillery should be familiar with naval formations and tactics and with characteristics of various types of naval vessels in detail. Some of the more important general characteristics of naval targets are—

a. As the result of *mobility* of the enemy fleet and relative immobility of seacoast armament, the enemy possesses important tactical advantages among which are the ability to select time and place for attack; to utilize the surprise element by rapid approaches and by naval and aerial demonstrations and covering attacks; to avail himself of any temporary advantages that may exist due to local conditions of weather, light, visibility, wind, and tide; to select range at which attack will be made and angle of presentation of ships to the plane of fire so as to be most favorable to himself and most unfavorable to the defense; to secure concealment for his own movements by use of smoke screens; and to withdraw from action whenever desirable.

b. Naval vessels in action against land defenses may be expected to move at such *speeds* and to take such advantage of low visibility as to reduce to a minimum the time they will be exposed to the effective fire of seacoast artillery.

c. Naval targets will normally consist of a *number of ships* in formation, all of which may be firing. It may be desirable

to keep several of these ships under fire. This requirement of simultaneous fire at a number of different ships in a formation imposes special requirements in fire control.

d. The problem in connection with *long-range fire* at a number of rapidly moving armored naval vessels against which direct hits only are of material effect involves special difficulties as compared with fire of similar armament in land warfare. Requirements for both rapidity and accuracy of fire are materially more severe in the case of seacoast artillery than in the case of artillery in land warfare.

e. The mobility, flexibility, and high speed of naval targets and the facility with which several different groups of vessels in different portions of the defended water area may act simultaneously result in *rapidly changing situations*. The necessity for correspondingly rapid changes in tactical employment of all elements of seacoast artillery requires a more extensive communication system than in the use of artillery in land warfare. It requires upon the part of each artillery commander the ability to make rapid and accurate estimates of the situation and to formulate and put his decisions into effect with corresponding rapidity.

■ 101. CLASSIFICATION AND GENERAL CHARACTERISTICS.—Considered as potential targets for seacoast artillery, naval targets are classified as capital ships and noncapital ships.

a. Capital ships are surface vessels of war mounting guns of a caliber exceeding 8 inches. They possess great fire power. This class includes battleships which are heavily armored and battle cruisers which are not so heavily armored. Employment of primary armament is required for attack of these ships.

b. Noncapital ships are all war vessels not classified as capital ships. Included in this class are aircraft carriers, submarines, and all vessels mounting guns of a caliber not exceeding 8 inches. Noncapital ships are usually lightly armored or unarmored and may be attacked by secondary armament.

■ 102. CAPITAL SHIPS.—Capital ships are generally divided into the following types:

a. Battleships (BB).—These ships form the first line of battle. They are the most formidable type of war vessel and combine powerful weapons with the greatest protection possi-

ble under limitations of size imposed. To carry the heavy guns and armor required to give maximum offensive and defensive power, speed has to be sacrificed to a certain extent. Characteristic features of battleships are great size, moderate speed, heavy armor, large guns in turrets, massive appearance, low to medium freeboard, and broad beam. Their main batteries are of a caliber exceeding 8 inches and may include 16-inch guns with an effective range of 35,000 yards.

b. Battle cruisers (CC).—In appearance these ships are similar to battleships although their lines are finer. While armed with the maximum caliber guns practicable, the number of guns carried is usually fewer and the armor protection less than the battleship. The weight in guns and armor so saved is utilized by battle cruisers in speed which is sufficiently great to permit them to separate from the battle line to gather information and yet be able to return in time to join the main action.

c. Pocket battleships are small armored ships mounting guns of large caliber. They are capable of greater speed than are battleships.

d. Other war vessels classified as capital ships because of their large caliber guns are provided for coast defense. They have a very limited speed and cruising radius and are not designed for fighting on the high seas. Monitors are an example of this type.

■ 103. NONCAPITAL SHIPS.—Noncapital ships are generally divided into the following types:

a. Airplane carriers (CV) are large ships of considerable displacement, moderate to high speed, some of them armored, armed with moderate sized guns, and carrying a large number of planes which are launched from and landed on specially constructed decks. The landing deck and the peculiar arrangement of the funnels and superstructure render these ships unmistakable. They are vulnerable to gunfire on account of their size and limited protection.

b. Cruisers vary from fairly fast, heavily gunned, moderately armored, large ships to fast, lightly armed, unarmored ships of moderate displacement. First-line cruisers are from 7,500 to 10,000 tons displacement, mount guns up to 8 inches in caliber, have up to 5 inches of side armor, and

are capable of speeds in excess of 32 knots. They are intended for scouting, screening fleet movements, raiding, and similar purposes. Cruisers may be further classified as—

(1) *Heavy (CA)*, armed with 8-inch or near 8-inch guns.

(2) *Light (CL)*, armed with guns smaller than 8 inches, usually 6 inches or less.

(3) *Antiaircraft*, whose total armament may be used against aircraft.

c. *Destroyers (DD)* are high speed unarmored naval vessels of approximately 1,500 tons displacement armed principally with torpedoes. In addition to making torpedo attacks, they may employ depth charges against submarines and may be used as mine layers. They mount guns of less than 6-inch caliber for their own defense and to attack unarmored enemy vessels.

d. *Submarines (SS)* operate either under water, awash, or on the surface. They are armed with the torpedo; the larger ones with mines and guns in addition. Aside from raiding operations, reconnaissance, and attempts against vessels within a fortified harbor, submarines have little use against coast defenses.

e. *Torpedo boats (PT)* are similar to but generally inferior to destroyers.

f. *Minor war vessels* consist of gunboats, mine layers (CM), escort vessels, and patrol vessels.

g. *Auxiliary vessels* consist of such ships as transports (AP), hospital ships, tenders, mine sweepers (AM), and tugs. Of these vessels the transport and the mine sweeper are of special interest in coast defense. They are usually commercial vessels with no armor and with but a few guns of 6-inch or smaller caliber. All vessels of this type are exceedingly vulnerable to the fire of all types of seacoast armament.

h. *Small craft* consist of small auxiliary vessels and the modern *motor torpedo boat*, a small vessel of great speed armed with torpedoes, mines, and automatic weapons.

i. *Landing boats* may vary from small, fast surf boats with a capacity of one squad to large, selfpropelled lighters capable of landing light tanks. All may be armed with automatic weapons.

■ 104. RECOGNITION OF SHIPS.—A ship may be recognized by its silhouette, that is, the outline of the solid features of the ship as seen at a distance. The silhouettes of present day naval vessels are shown in such standard works as Jane's "Fighting Ships" or Brassey's "Naval Annual." All coast artillerymen should be thoroughly familiar with the silhouettes of the ships they may be called upon to identify in time of war. Silhouettes are classified for convenience by using the number of funnels and masts as a basis, for example, class 1-2, in which the first digit 1 indicates the number of funnels and the second digit 2 the number of masts.

■ 105. NAVAL UNITS.—The usual grouping of naval vessels into units is as follows:

- a. *Battleship division*, 3 or 4 battleships.
- b. *Battleship squadron*, 2 battleship divisions.
- c. *Cruiser division*, 4 cruisers.
- d. *Cruiser squadron*, 2 cruiser divisions.
- e. *Destroyer division*, 6 destroyers.
- f. *Destroyer squadron*, 3 destroyer divisions, 1 cruiser (flagship), 1 destroyer tender.
- g. *Destroyer flotilla*, 3 destroyer squadrons, 1 cruiser (flagship).
- h. *Submarine division*, 3 to 10 submarines of the same type, 1 submarine tender.

■ 106. NAVAL BATTLE FORMATIONS.—a. *Firing*.—Where hydrographic conditions permit, it may be expected that naval firing formations will be such as to impose the least restriction upon the number of naval guns that can fire effectively, to permit firing on approximately straight courses, to permit the use of single formations, and to present as unfavorable target angles as practicable. Figure 4 illustrates probable naval firing formations.

b. *Maneuvering*.—Considerations in a above indicate that where maneuvering space is not restricted the fleet formation in a bombardment will probably be such as to permit broadside fire from all turrets. A formation in column or a line of bearing approximately perpendicular to the line of fire meets this condition. Furthermore, these formations

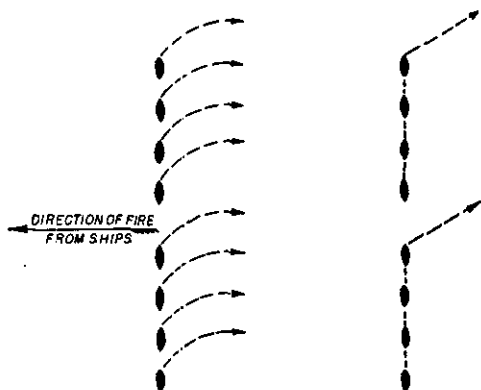


FIGURE 4.—Probable naval firing formations.

permit the range to be increased or decreased by simultaneous movement by individual ships or by divisions. Figure 5 illustrates probable naval maneuvering formations.

SECTION IV

EFFECTS OF FIRE

■ 107. EFFECTS OF SEACOAST ARTILLERY FIRE ON NAVAL TARGETS.—Conclusions as to effects of fire on naval targets insofar as they may be applicable to tactical employment of seacoast artillery must be based upon consideration of probable average conditions and must necessarily be general in nature. Certain conclusions as to probable effect of fire upon different type naval vessels follow.

a. The *modern capital ship* can withstand a considerable amount of fire. While nonperforative hits on side armor may do considerable local damage, such hits are unlikely to result in serious damage to engine or firerooms or to affect materially fire of main batteries. Hits on secondary batteries will probably result in placing out of action a few of the secondary guns, but damage will be local and will be relatively unimportant. The principal fire effect may be expected to result from perforative hits against the armored deck, side armor, and below the armor belt. Such hits may result in

magazine explosions, or in the case of deck hits or hits below the armor belt may result in damage to the engine and fireroom. Maximum effectiveness of fire against capital ships requires use of projectiles which are capable of perforating the armor without breaking up and of bursting

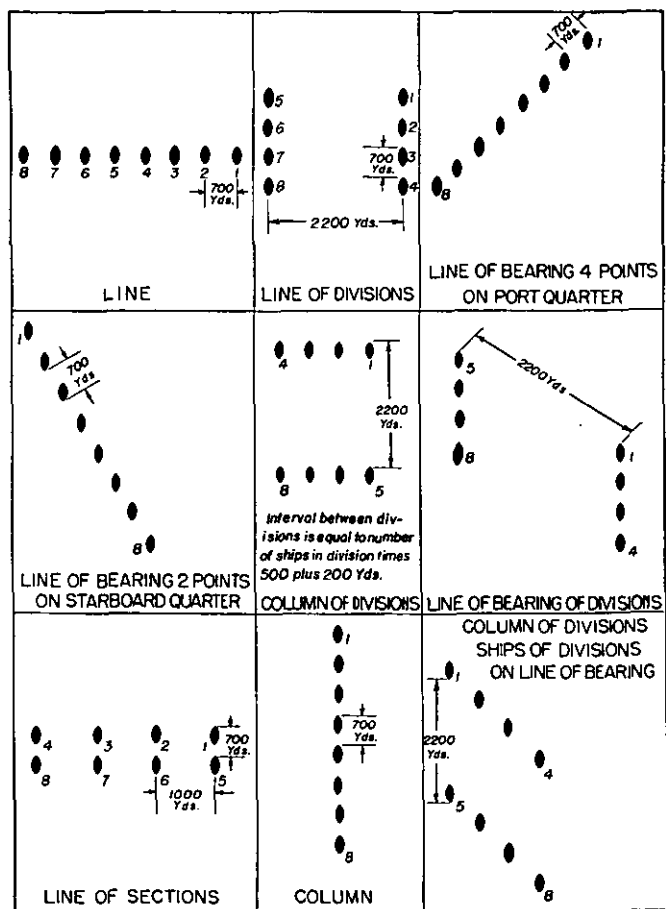


FIGURE 5.—Naval maneuvering formations.

within the vitals of the ship. Effectiveness of a perforative hit is materially greater than that of a nonperforative hit, irrespective of actual penetration into armor of the non-perforative hit.

b. Modern cruisers, especially heavy cruisers, possess armor protection which will enable them to withstand a considerable amount of fire from 6-inch and smaller caliber guns. This armor protection varies so greatly that in order to estimate probable fire effect of secondary armament batteries against these ships, a knowledge of distribution and thickness of their armor, and an understanding of armor penetration and probability of hitting are necessary. For destructive effect against more heavily armored cruisers, 8-inch or greater caliber guns should be employed.

c. The fire of 155-mm or 6-inch guns is sufficient to put a *destroyer* out of action.

d. Because of presence of powder, fuel, oil, and other combustibles, serious *fires* may be expected to occur on all types of ships during an action. Such fires with attendant likelihood of *explosions* will constitute an important fire effect upon naval targets.

e. During an action effect of the spread of *gas, smoke, and powder fumes* through ventilating trunks, voice tubes, or other channels may be expected to handicap the personnel, and in some cases to necessitate wearing gas masks, particularly when gas shells are used.

■ 108. NAVAL ARMOR.—Armor may be considered in two general classes:

a. Face-hardened armor is normally used for vertical protection in the form of waterline belts, barbettes, turret faces and sides, and conning towers. The purpose of the hardened face is to break up the projectile.

b. Nonface-hardened armor is normally used for horizontal protection in the form of turret tops, conning tower tops, protective decks, transverse bulkheads, gun shields, and belt line protection above the water line. Characteristics of this armor are such that when it is exposed to oblique fire it tends to "dish" without cracking and is able to withstand greater striking energies without being perforated than face-hardened armor.

■ 109. PENETRATION OF PROJECTILES.—*a. The effect of the cap* on an armor-piercing projectile is to increase penetrating power of the projectile at both normal and oblique impact and to increase the maximum angle from normal at which the projectile will bite and penetrate instead of glance or ricochet.

b. In some recent ships the weight of side armor has been reduced materially by use of armor inclined outward toward the top. Thus protection is obtained with lighter armor inclined so that projectiles will strike at greater angles from normal than would be the case against vertical armor.

■ 110. ARMOR ATTACK.—*a. Factors affecting penetration.*—In considering armor-penetrating ability of a projectile against a ship, principal factors are the striking velocity of the projectile and the angle from normal at which it strikes side or deck armor. In general the angle from normal at which a projectile strikes is dependent chiefly upon angle of fall, target angle, inclination of armor installed on the ship, and roll and list of the ship. For horizontal armor the angle from normal is not affected by the target angle which is the angle between the plane of fire and the vertical plane through the keel line of the ship.

b. Employment of seacoast artillery.—In considering tactical employment of seacoast artillery against a ship therefore considerations of primary importance, insofar as armor penetration is concerned, are the ranges at which, considering the target angle, side armor and deck armor perforation can be obtained.

■ 111. EFFECTS OF SEACOAST ARTILLERY FIRE ON LAND TARGETS.—Seacoast artillery is designed and emplaced primarily with a view to its employment against naval ships. The type of emplacement of fixed harbor defense artillery often limits its use against land targets. However, with some of the newer types of fixed primary armament and with all types of mobile armament all around fire is practicable. Armor-piercing projectiles are unsuitable for firing on land targets for the reasons given in paragraph 99.

■ 112. EFFECTS OF NAVAL FIRE ON SEACOAST ARTILLERY.—Naval vessels in attack of land targets may be expected to use high explosive shell and high angle fire in order to increase fire

effect. However, destruction of seacoast artillery matériel probably will be caused chiefly by direct hits, the probability of many such hits not being great. A partial degree of neutralization may be expected if the enemy has good observation and is undisturbed by accurate return fire. Where capital ships are allowed to close to within range of their secondary armament, a high degree of neutralization and considerable damage to unprotected stations, magazines, communication, and inflammable material may be expected.

SECTION V

CONTROL OF FIRE AGAINST NAVAL TARGETS

■ 113. GENERAL.—Because of the characteristics of naval targets, seacoast artillery has a special problem in fire control. It must be able to fire simultaneously on a number of relatively small, rapidly moving, armored targets; make necessary changes in types of projectiles or weights of propelling charges; and take full advantage of fleeting opportunities to deliver an intensive and accurate fire. Further, tactical commanders must be able to direct fire rapidly and effectively at all times. Therefore seacoast artillery requires special matériel, equipment, and training.

■ 114. DEFINITIONS.—In connection with the discussion in this section the following definitions are given:

a. *Conduct of fire* is employment of technical means to place accurate fire on a target. Fire is usually conducted by the battery which is the normal fire unit.

b. *Fire direction* is exercise of tactical command of one or more units in selection of objectives and in concentration or distribution of fire thereon at appropriate times.

c. *Fire control* is exercise of conduct and direction of fire. Fire-control equipment and installations are used both for technical conduct of fire and tactical direction of fire.

■ 115. CLASSES OF SEACOAST ARTILLERY FIRE.—Seacoast artillery fire is classified according to its purpose as follows:

a. *Destruction fire* is the normal class of fire employed by seacoast artillery. It is employed to effect maximum practicable amount of destruction of enemy ships. Development of sufficient fire power for destructive effect ordinarily requires

that the greatest practicable number of batteries be put into action and that the highest practicable continuous rate of fire be maintained.

b. Neutralization fire is employed where destruction fire is unsuitable or impracticable, and is delivered for the purpose of limiting effectiveness of hostile naval activity. The number of batteries put into action and their rates of fire are reduced to the minimum that will accomplish the desired purpose.

c. Interdiction fire is employed to prevent access by enemy ships to a certain locality. It may be used when observation of the ships by ordinary means is impracticable but when their general locations and movements are known through other agencies such as patrol boats. The rate of fire and number of batteries put into action may vary from that employed in destruction fire to one or more batteries firing at a slow rate, depending upon degree of accuracy with which position of the enemy is known, kind of vessels to be fired on, and extent of the area to be covered by fire (see par. 168*b*).

■ 116. FACTORS DEPENDING UPON TYPE OF SEACOAST ARTILLERY.

—*a. Characteristics of seacoast artillery affecting its use.*—Each type of seacoast artillery has certain characteristics which are important factors in determination of the kind of armament which is most suitable for use against a particular target. These characteristics include for each type range, normal probable error, rate of fire, time required to adjust fire, and armor penetration of the projectile. Dispersion affects probability of hitting at different ranges and with armor-penetrating capability of the projectile is taken into consideration in damage tables.

b. Time element.—The normal length of time from initial assignment of a target until beginning of effective fire varies for different types of seacoast artillery, depending in a large degree on whether or not it is necessary to adjust fire and, if necessary, on method of adjustment employed. When it is unnecessary to adjust fire or when the target is moving across the field of fire, the time factor is of comparatively little importance in determining relative suitability of using guns or mortars. However, in the case of targets moving end-on at high speed the time factor may make use of zone weapons

undesirable unless trial shots have been fired in each zone as a basis for initial adjustment in that zone.

■ 117. FACTORS DEPENDING UPON TARGET.—*a. Factors affecting penetration.*—In assignment of a target to be fired on by seacoast artillery, consideration must be given to armor protection of the target and to its course, range, and speed. In order to effect armor perforation against heavy armor the projectile should strike at an angle from normal not exceeding about 30° . Considering side armor alone, a vessel moving on a course such that the target angle is less than about 70° affords for guns of flat trajectories a much less favorable target than one which presents a more nearly broadside target. The target angle does not however affect penetration of horizontal or deck armor, nor striking of turret faces. It follows that except at ranges at which perforation of side armor is possible the target angle is not of vital importance.

b. Factors affecting accuracy of fire.—In the case of targets moving on sinuous or zigzag courses accuracy of fire is materially reduced, particularly in high-angle fire when time of flight is comparatively long and prediction errors consequently greater.

c. Range.—It may be expected that the enemy will seek to conduct an action (not involving a run-by) at ranges most favorable to himself and most unfavorable to seacoast artillery. In this connection action of the enemy fleet will be influenced by—

- (1) His mission.
- (2) Strength in ships, their armor, number of guns, and effective ranges.
- (3) Extent of his control of the sea.
- (4) Extent of his control of the air.
- (5) His means of aerial observation.
- (6) Visibility.
- (7) Hydrography.
- (8) Strength in guns and effective ranges of seacoast artillery and land-based air defenses.

d. Comparative effect of naval and seacoast artillery fire.—In general naval action will be influenced to a large degree by comparative effect of naval artillery fire and seacoast artillery

fire. Consideration should be given to both range and target angle factors, of which range is probably the governing factor in view of high mobility of naval vessels. When the mission of the enemy can be accomplished by long-range fire, such action may be expected. When his mission cannot be accomplished by long-range fire, more intensive and accurate fire at close range may be expected. Where hydrography permits, he may be expected to take advantage of sinuous or zigzag courses, target angles unfavorable to seacoast artillery, smoke screens, darkness, and low visibility.

■ 118. CONCENTRATION AND DISTRIBUTION OF FIRE.—*a. Selection of class of fire.*—No rigid rules can be formulated as to when concentrated or distributed fire will be employed, that class of fire being used which is best calculated to defeat the enemy's mission.

b. Distributed fire.—A distribution of fire has two important advantages: first, by keeping a larger number of hostile ships under fire, it lessens effectiveness of enemy fire; and second, it facilitates airplane and terrestrial spotting and fire adjustment. For neutralization of enemy fire, it is generally necessary to employ distributed fire. In most combat situations it is desirable to take under fire as many as possible of the enemy ships which are firing on the defenses, employing some of the secondary armament to fire on capital ships when necessary. However, it is impracticable for an individual battery to conduct fire at more than one target at a time.

c. Concentrated fire.—Batteries in excess of the number required to place some fire on all hostile ships should concentrate preferably on guide and control ships, since sinking or disabling one of these ships will produce a maximum amount of confusion in hostile ship formations. Also, there are special situations in which concentrated fire is preferable to distributed fire. For example, when a column of hostile ships is approaching a narrow channel, sinking or disabling the leading ship may disrupt the entire formation. When a hostile ship formation is laying a smoke screen, it may be possible to observe and fire effectively on only the leading ship. In either case, a heavy concentration of fire should be placed on the leading ship in order to break up the for-

mation. Fire control in concentrations is facilitated by assigning missions of destruction to the smallest unit capable of delivering the required volume of fire, rather than to batteries of different groups or groupments. Over concentration of fire on one ship should be avoided, for the difficulty of spotting and adjusting fire of too many batteries on one target greatly reduces effectiveness of fire on that target.

■ 119. FIRE AGAINST CAPITAL SHIPS.—*a. Volume of fire.*—In general, in an action between capital ships and seacoast artillery the capital ship will be able to deliver greater volume of fire because of greater number of cannon available and the fact that all primary armament of a ship can be brought to bear on any desired target.

b. Use of primary armament.—Long range bombardments by capital ships will sometimes be conducted at ranges beyond those at which destructive effect can be expected by seacoast artillery. In order to lessen effectiveness of enemy fire as well as to facilitate adjustment, it is well to distribute fire of the defender's primary armament so as to bring as many vessels as possible under fire. Batteries in excess of the number required for this should concentrate preferably on guide and control ships. Since destruction of a vessel will probably have more effect upon enemy action than minor injuries to several vessels, when the enemy closes to ranges where destruction may reasonably be expected, concentrations of primary armament sufficient to be effective should be made upon selected vessels.

c. Use of secondary armament.—Secondary armament not required for other use may be used advantageously against capital ships. While destructive effect cannot be expected from this armament, considerable neutralization may be effected.

■ 120. FIRE AGAINST NONCAPITAL SHIPS.—*a. Whenever it is possible to fire on loaded enemy troop transports with a reasonable probability of hitting, sufficient fire should be concentrated, employing primary armament if necessary, to insure their destruction. If auxiliary naval vessels or commercial vessels are used to block narrow entrances, the same tactics should be employed as in the case of loaded transports.*

b. *Cruisers* of various types are suitable targets for secondary armament. Rapid-fire batteries should be employed against the faster, more lightly armored cruisers.

c. Destroyers are suitable targets for the smaller calibers of secondary armament in view of the high rate of fire and the large amount of ammunition available to these guns. In case of good visibility, fire should be opened as soon as the targets approach within effective range, and it should be so distributed as to facilitate observation of fire and to insure that maximum amount of damage may be effected during the relatively short time that the targets may remain within effective range.

d. *Submarines* are suitable targets for the smaller calibers of secondary armament. Because of the small size of the target and the fact that submarines may be expected to operate frequently under conditions of poor visibility, a concentrated fire should be delivered as soon as they approach within a reasonably effective range.

CHAPTER 8

TYPES AND POSITIONS OF SEACOAST ARTILLERY

	Paragraphs
SECTION I. Armament requirements	121-123
II. Positions for seacoast artillery	124-126

SECTION I

ARMAMENT REQUIREMENTS

■ 121. SCOPE.—This chapter covers the amount and location of fixed and mobile seacoast artillery either within or without a harbor defense. Except where the type of armament is specifically mentioned, the doctrines given in this section are equally applicable to all types of seacoast artillery. However, since decision as to amount, kind, and location of fixed harbor defense artillery is not necessarily a function of the commander responsible for its tactical employment, the doctrines have more practical application in connection with mobile seacoast artillery.

■ 122. TYPES OF ARMAMENT REQUIRED.—*a. Primary armament.*—(1) In defense of harbors of great strategic importance and in defense of portions of the coast where landings in force are probable, emplacement of long-range primary armament or provision for its emplacement is necessary. For more important harbors the policy is to install fixed 16-inch guns which, with their long range and fire power and the accuracy inherent in permanently emplaced guns, will reduce effectiveness of or make costly naval bombardments against installations they are emplaced to protect, and will be able to cover the debouchment of friendly naval forces. For defense against landings in force on vital areas of the coast not covered by fixed primary armament, provision should be made for employment of 14-inch or 12-inch railway guns.

(2) The 14-inch railway guns, if available and if suitable trackage exists, may also be employed to reinforce fixed guns in important harbor defenses. Both fixed and railway

12-inch guns and mortars will constitute primary armament defense in less important harbor defenses and on less important portions of the coast. They will also have missions in reinforcement of the larger guns in areas where these are located.

b. Secondary armament.—For attack of heavy cruisers whose range of armament and armor protection renders them relatively invulnerable to fire of 6-inch and 155-mm guns, the defense should be provided with a larger caliber and greater range weapon. For attack of fast, lightly armored or unarmored vessels and landing boats, guns combining a high rate of fire with considerable range are necessary. 6-inch fixed guns, which are emplaced in harbor defenses for this purpose, may be reinforced by 155-mm guns. Outside of harbor defenses rapid-fire defense against naval vessels will be provided by 155-mm guns, and against landing operations 75-mm guns will be used to reinforce fire of 155-mm guns (out to about 4,000 yards from shore).

■ 123. **FACTORS AFFECTING AMOUNT OF ARMAMENT.**—The kinds and amount of seacoast artillery required in defense of a harbor will depend upon strategic and tactical factors.

a. Importance of a harbor is not determined by size of the port in the vicinity but is based on strategic value of the harbor both from our point of view and from that of the enemy. In general, sufficient armament should be provided to meet any attack which may be expected, considering value of the objective to the enemy. Any harbor classed as vital may be assumed as a primary objective of a possible enemy, and the harbor and any portions of the coast in the vicinity providing suitable landing beaches and land approaches thereto must be defended accordingly.

b. Hydrography of approaches affects the number and the draft of vessels that the enemy can employ advantageously and character of maneuvers and formations practicable in the various parts of the field of fire. It also determines the practicability of effective use of submarine mines, nets, and other underwater obstructions, and affects to a material degree amount and location of secondary armament required.

c. Topography of the locality influences the number of suitable sites for battery positions and for auxiliary equipment

such as fire-control stations, power plants, magazines, and other structures. It affects amount of concealment and protection practicable, extent to which observation of fire especially at long ranges is practicable from land stations, manner in which units may be grouped, and movement of reinforcements by land routes.

d. Other factors.—In arriving at a conclusion as to the amount of armament required for a given locality, relative probability of hitting and relative damage that may be expected to be caused by hits in the case of seacoast artillery and naval guns must be considered. In this connection it may be noted that fire of ships is subject to many special difficulties which make it possible to employ considerably less armament ashore than will be carried by a probable attacking force.

SECTION II

POSITIONS FOR SEACOAST ARTILLERY

■ 124. GENERAL FACTORS.—Factors to be considered in selection of positions for seacoast artillery are attainment of effective fire, concealment and protection, location of other defensive elements, and requirements of local defense.

■ 125. ATTAINMENT OF EFFECTIVE FIRE.—*a. Water areas to be covered.*—Attainment of effective fire is the first consideration in locating positions for seacoast artillery. This requires that the armament be located to insure covering at effective ranges the maximum area of navigable water from which hostile vessels may be able to attack the defended land area. In general, that position is best which offers the widest field of fire and the greatest range over navigable water. It is important that the location of defense elements be such as to insure a minimum of dead spaces in the field of fire.

b. Concentrations of fire.—When the entire navigable water area from which hostile vessels can operate against the defenses has been covered, additional armament may be emplaced so that heavier concentrations of fire can be placed on critical parts of the field of fire.

c. Armament location.—(1) *Primary.*—Primary armament in a harbor defense should be so located with reference to the

utilities it defends as to bring fire on enemy vessels approaching to within effective range of the utilities, and located with respect to a harbor which is likely to be used by our naval forces so as to be able to protect the fleet when within, debouching from, or entering the harbor. Primary armament assigned to support beach defense forces should be located to cover all water areas from which hostile capital ships might bombard the shore defenses, especially those areas from which hostile secondary batteries could be employed to advantage.

(2) *Mortars*.—Mortars are most effective if they can be located to cover main channels or other water areas of limited extent through which capital ships will be forced to pass in approaching a harbor. They should be located, if practicable, so that their probable targets will traverse the minimum number of zones. This consideration, however, should not govern to the extent of sacrificing other necessary features such as range or effective fire direction and control.

(3) *Secondary*.—Secondary armament should be located to provide for protection of mine fields, nets, and other barrier areas, and for attack of cruisers, destroyers, or other craft engaged in raids, reconnaissances, laying of smoke screens, or in operations connected with landings in small boats. Since targets of rapid-fire batteries will ordinarily be within range of good visibility and will move at high speed on sinuous courses, these batteries preferably should be sited to permit direct aiming. It is desirable that positions for batteries intended for *protection of mine fields* be located to cover not only approaches to the mine fields, but also all the area in the vicinity of the fields where mine-sweeping operations might be conducted.

(4) *Mobile artillery*.—In beach defense, the 75-mm guns will be able to engage effectively small boats, barges, and unarmored vessels near the shore. For this reason, in planning location and fields of fire of the 155-mm batteries assigned to beach defense, it is unnecessary for them to cover an area which may be assumed to extend about 4,000 yards from the shore line if 75-mm guns are available. Tractor-drawn batteries generally should be located near

suitable roads to facilitate moving the guns and ammunition supply, and where practicable they should be provided safe routes of withdrawal. Railway batteries ordinarily will be limited to positions on or near existing railway lines as building long access tracks will not be feasible, and where practicable they should be provided safe routes of withdrawal.

■ 126. PROTECTIVE FACTORS.—*a. General.*—Troop protection of seacoast artillery elements located within harbor defenses will be provided by seacoast artillery troops and by such other land forces as may be assigned for the purpose. Batteries outside of harbor defenses should be located where they will receive the protection of beach defense forces. The probability of damage from enemy fire may be reduced by protecting batteries, magazines, and other installations by material construction, concealment, and dispersion.

b. Lay-out of battery and auxiliary installations.—In selecting sites and planning the lay-out of seacoast artillery batteries, the following should be provided when applicable: protected power plant, protected plotting room, and magazines of sufficient capacity for at least 1 hour of fire at the normal rate; minimum exposure of ammunition during service of the piece or during movement of ammunition from magazine to magazine or piece; provision for installation of collective gas protection for certain rooms; essential sanitary facilities and storerooms; guns separated by such intervals as to reduce the possibility of more than one gun being put out of action by one shell burst; and maximum attainable personal supervision of the manning personnel by the battery officers. The above is particularly applicable to fixed batteries that have been planned and constructed under peacetime conditions. Mobile batteries will move into unprepared positions where all or some of the above named facilities will have to be improvised. In selecting positions the above essentials should be considered in order to facilitate their later construction.

c. Ammunition.—Ammunition in excess of that stored in protected magazines at the batteries should be stored in localities not in themselves probable objectives of enemy fire, provided that replenishment of ammunition required by the

batteries may be effected without unwarranted delay. If no such locality is available, protected storage for additional ammunition may have to be provided at or near the battery, as determined by special study in each case.

d. Dispersion.—Reasonable interval between elements of the battery serves to reduce extent of the damage by a single projectile or bomb and to facilitate concealment of these elements by allowing more latitude in their location. Minimum intervals of about 150 yards between guns of a primary battery, 50 yards between mortars and between 8-inch guns, and 25 yards between guns of other batteries of secondary armament are desirable. If traverses of natural terrain features or of artificial construction can be located between guns these figures for minimum intervals may be reduced. Unnecessarily large intervals between guns of a battery render conduct of fire more difficult, especially under emergency conditions, and may reduce accuracy of the battery's fire. It is essential that dispersion be not so great as to cause delay in supply of ammunition or unwarrantably increase cost of installation. The same general considerations apply to location of batteries with respect to each other as apply in the case of guns of a battery. The interval between batteries should be great enough to prevent an effective concentration of fire by the enemy covering more than one battery. Because of the great length in direction of fire of the pattern in naval gunfire, an arrangement in depth should be avoided. In order to minimize as much as practicable the effect of airplane bombing, an arrangement of the various elements in a straight line should also be avoided.

e. Utilization of terrain.—Within restrictions imposed by minimum range requirements, use of indirect fire by seacoast artillery permits utilization of concealment and cover afforded by the terrain. Advantage can therefore generally be taken of woods, ridges, sand dunes, and similar natural masks to conceal the position of a battery from naval observation. Since the location of fixed batteries constructed in time of peace will ordinarily be known to the enemy and naval air attacks upon seacoast defenses are probable, it is important that special attention be given to securing maximum practi-

cable concealment from aerial observation and attack. Application of camouflage is discussed in chapter 9.

f. Duplication of elements.—In the unprotected type of battery, dependability may be increased by duplicating certain essential elements such as magazines and power plants. Plotting and switchboard rooms are ordinarily protected, not duplicated.

g. Distance from shoreline.—Batteries should be located far enough from the shoreline to prevent hostile naval guns from adjusting fire on them by means of ranging on the shoreline. In order to satisfy this condition batteries ordinarily should be located a minimum of 500 yards to 1,000 yards from shore. Advantages of locating batteries well back must be weighed against disadvantages of loss of range, possible loss of direct fire, and existence of dead areas.

h. Location of alternate elements.—In general, other elements of the defense such as fire-control stations and searchlights are located to cover all water areas necessary and at the same time not be subject to injury by fire directed at the batteries. It is desirable to provide alternate stations for use in event of destruction of observation stations. This is especially important in those older installations where stations are grouped.

i. Local security.—If consistent with other important considerations, sites selected should be such that through provision of a small beach defense force and field fortifications they can be made reasonably secure against landing raids. Difficult water approaches and high cliffs near the shore line facilitate local defense and permit batteries to be located nearer the water's edge than is advisable where natural features are less favorable.

j. Alternate and withdrawal positions.—Alternate positions should where practicable be prepared for all batteries of mobile seacoast artillery; positions to which batteries can be moved when their initial positions are rendered untenable by enemy fire, but from which their initial missions can be performed. Withdrawal positions should also be selected and prepared, and routes thereto reconnoitered if the general plan indicates need therefor.

CHAPTER 9

PROTECTION

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SECTION I

GENERAL

■ 127. COVER, CONCEALMENT, AND PROTECTION.—Throughout this manual the term “cover” is used to indicate means employed for prevention of injuries to personnel or matériel; the term “concealment” to indicate means taken by utilizing natural concealment or erecting camouflage to prevent hostile discovery of installations. Both terms are included in the term “protection.”

■ 128. OBSERVATION AND CONCEALMENT.—*a. Observation* is direct or indirect. *Direct* observation is by direct vision, aided or unaided by field glasses or telescopes. It is obtained from observation posts, balloons, or airplanes, and so may be either terrestrial or aerial. *Indirect* observation resulting from the study of aerial photographs is more liable to expose attempts to conceal installations than direct observation. The camera is an accurate witness, and its lens is in many respects a more perfect instrument than the human eye. The camera registers all details in exact relation to each other. From such photographs the expert interpreter is remarkably skillful in translating apparently insignificant details into important military intelligence.

b. Concealment in the case of seacoast artillery is sought from hostile observation from naval ships or high points within the enemy line, and hostile aerial observation and photography.

SECTION II

CAMOUFLAGE

■ 129. GENERAL.—*a. Purpose.*—Deception of the enemy is the prime object of camouflage. Concealment from view is not essential provided the object camouflaged appears as a natural part of its surroundings.

b. General means.—Deception of the enemy is gained by—

(1) Suppressing all signs of abnormal activity near the object or deceiving the enemy as to purpose of activity.

(2) Making object indistinguishable from its surroundings.

(3) Making object appear to be something else.

c. Relative importance of factors.—In general, effectiveness of camouflage depends on the following factors in the priority indicated:

(1) Proper choice of position.

(2) Camouflage discipline.

(3) Proper erection of camouflage material.

(4) Camouflage material used.

d. Importance to artillery.—Camouflage is of great importance to artillery. The heavier the matériel and the more elaborate the fire-control system, the greater the necessity for avoiding discovery. Camouflage which is erected as concealment for a battery position which has been previously photographed by hostile reconnaissance agencies will probably be ineffective. In situations where hostile aerial reconnaissance may be expected it is essential that battery positions be camouflaged *prior* to emplacement of the matériel. The advantage of continued occupation of a position with freedom to deliver uninterrupted fire emphasizes the importance of camouflage. This is particularly important in seacoast defense, because the total *gun power* of a naval fleet will almost always exceed in caliber, range, and volume of fire any defensive artillery concentration likely to be available. Also, the defensive elements are frequently closely grouped, making them more vulnerable to attack from sea and air.

■ 130. CONCEALMENT FROM TERRESTRIAL OR SHIPBOARD OBSERVATION.—*a. General.*—Terrestrial or shipboard observation, although more distant than observation or photography from the air, is much more continuous and is important. The gun

pointer or operator of the director must see his target or some nearby landmark which he can use as a reference point. The defense will keep hostile naval ships moving if within range. Map firing at a small target by a moving ship is not effective.

b. Fixed seacoast artillery.—Because of size and prominent locations of older fixed batteries, it is difficult to prevent naval observation. It can be hindered by—

(1) Breaking up straight lines of all artificial works (batteries, fire-control stations, searchlight towers), irregular vegetation, and large irregularly shaped fms made of camouflage material.

(2) Dotted smooth slopes of earthwork with shrubs to cast uneven shadows.

(3) Planting trees and arranging vegetation to prevent sky lining.

c. Mobile seacoast artillery.—Mobile armament except railway artillery, being smaller, is more easily concealed from observation. It can select positions favorable for concealment. If indirect fire methods are to be used it may be emplaced in positions that allow flash defilade. For the 155-mm gun the approximate height of flash above muzzle is 13 yards, and height of visible part of smoke above muzzle is 22 yards. Occupation of reverse slopes will increase defilade that can be secured from shipboard observation and increase difficulties of naval counterbattery fire. These advantages as well as others pertaining to such positions more than offset the disadvantages of loss of direct pointing, providing an excessive amount of over-water range is not sacrificed. Care must be taken however that guns will clear the mask at sufficiently low elevations to permit attainment of required minimum range. Rapid-fire batteries are usually emplaced in direct fire positions where such positions are available. When sited for direct fire, movable screens or shutters of freshly cut vegetation may be used to hide the position until fire is opened.

d. Searchlights.—Special effort should be made to conceal positions of fixed searchlights because of their vulnerability and because if accurately located by an enemy they may serve as aids to navigation in night operations. Mobile

searchlights should be used at points considerably distant from their place of daylight storage, changing position from night to night. If several lights are available no one light should be used long. It should be occulted, and after it is entirely dark another light should go on in a different location.

e. Fixed fire-control stations also should be concealed carefully, using dark-colored paints, vegetation, and large irregularly shaped fins to break up sharp outlines. To deny effective hostile use of coincidence range finders, there should be no vertical lines on which to sight.

■ 131. CONCEALMENT FROM AERIAL OBSERVATION AND PHOTOGRAPHY.—In addition to concealment from shipboard observation, concealment from aerial observation and photography is of great importance. This is obtained by use of natural concealment and camouflage. Lack of such concealment not only permits aerial adjustment of ship's fire but subjects artillery elements to aerial attack.

■ 132. CONCEALMENT OF FIXED DEFENSES.—It is a difficult task to try to camouflage fixed defenses. Concealment of fixed seacoast artillery against visual observation from the air is easier than against photographic observation. Since practically all of the seacoast emplacements were installed before development of aircraft and without regard to their being camouflaged, proper choice of position, the most important requirement in camouflage, has been eliminated. Instead of being able to assist in camouflage of a position by proper location, a very conspicuous one must be accepted and an attempt made to camouflage it by proper choice and erection of camouflage and by strict enforcement of camouflage discipline. In the case of older fortifications where the batteries are located in straight lines just back from the water, concealment is impracticable. However, every effort to make a battery less conspicuous is desirable, and the following methods are applicable for the various types of batteries.

a. For all type batteries, shrubs in tubs can be used on horizontal concrete surfaces where they will not interfere with normal battery activities. There is little gain in coating matériel and concrete in contrasting colors. Any dark neu-

tral color is better. As oil paints create reflecting surfaces, an asphalt emulsion should be used.

b. Camouflage of fixed seacoast *disappearing* gun batteries is difficult. Nets can be used which cover the whole span of the emplacement. On account of the blast effect they must be substantially constructed, and it must be possible to roll them back out of the way when the battery is to go into action. Small metal posts with pulley wheels or rings at the top must be secured into the concrete to carry the cable which supports the net.

c. For *barbette* batteries without parapets, a central framework may be erected on the racer or the ground outside. It should be readily dismountable.

■ 133. CONCEALMENT OF TRACTOR-DRAWN BATTERIES.—a. Tractor-drawn batteries can be concealed more easily than fixed batteries, as it is possible to emplace them where natural overhead concealment already exists. Skillful selection and careful occupation of positions enable a mobile battery to secure concealment with a minimum use of camouflage material.

b. Concealment of the matériel itself is only part of the problem. Batteries may be detected because the camouflage nets are visible. They may be too light in color or woven too heavily at the edges so that a shadow is cast. New roads or trails made up to the battery or old roads used more up to the battery than beyond it may reveal the location. Roads widened at the battery by turning of ammunition trucks, blast marks, ammunition piles, kitchens, latrines, dugouts, wire entanglements, or converging telephone lines in its vicinity tend to reveal a battery.

c. The following considerations are important:

(1) If possible, secure an aerial photograph of the area before reconnaissance for positions. If this cannot be done, try to imagine how the ground will look from above. Plan installation of battery and camouflage to make the ground look as it did before the position was occupied. The less change in appearance of a locality the better the concealment. If a change is necessary, make it irregular so as not to attract attention.

(2) Natural concealment is better than the most expert camouflage. Suitable choice of site minimizes labor of con-

cealment and expedites its completion. Look first for natural overhead concealment, second, for positions in broken terrain (among trees, shrubs, clumps of brush, or buildings) which make a patchy pattern and confuse the eye. A uniform surface such as open grassland or a ripe wheat field makes the worst possible background. A short and concealed route of approach from the road is most important. When complete overhead concealment cannot be secured a variety of color and texture (shadow content) is desirable. Colors or textures that match to the eye seldom match in a photograph. For positions visible from above a net of varied color offers excellent concealment against a background of broken pattern.

d. Positions 500 yards or more from the shore and on or near a road are least conspicuous and most desirable. Positions remote from a conspicuous landmark such as a bridge, tower, road junction, or spur track are of advantage in avoiding air attack as it is difficult to attack a target hard to see or locate by visible objects. Wide and irregular spacing of guns decreases visibility and vulnerability but complicates fire control, particularly against moving targets, but when practicable guns should be given dispersion both laterally and in depth as an aid to concealment and to reduce vulnerability. It is most important to avoid showing four similar shadows or four blast marks regularly spaced in a straight line. An important factor is the conformation of natural overhead cover. If this is not continuous along the battery front, gun positions should be arranged to fit.

e. Concealed shelters must be provided close to the guns for such men as are immediately required to develop and maintain full fire power of the battery. The rest of the battery and the kitchen should be located at a distance. Concealment of camps, kitchens, latrines, and movement of personnel is no less important than concealing the matériel itself.

f. Making new paths in the open while reconnoitering, preparing, or occupying the position should be avoided. Paths which are to be used should be wired in and men required to keep within them. If guns and ammunition can be brought up either partly or wholly under natural overhead cover the chances of successful camouflage are greatly improved.

g. Edges of artificial overhead concealment must be properly thinned to prevent shadows. Avoid straight lines and right angles. Aerial photographs are taken at altitudes of from 1 to 4 miles, and the work must be planned on a scale to correspond. The edge of a saw at a distance looks like a straight line. Irregularities in the borders of a net must be at least 25 feet in length to deceive the eye.

h. Blast marks show as white blurs in front of each gun. They may be concealed by a low wire framework of irregular shape placed in front of each gun. This will support brush at a natural angle and darken the area as seen from above. The vegetation must be renewed as it withers or is worn away in firing.

i. Material that lies flat shows light in a photograph. Natural vegetation photographs dark because of the contained shadow. Burlap should be colored so that it seems to be much too dark.

■ 134. CONCEALMENT OF RAILWAY BATTERIES.—The same considerations apply as for tractor-drawn batteries, except that choice of positions is restricted to sites in the vicinity of existing railway lines. It is exceedingly difficult to conceal the approach track to the battery. A railroad spur position can perhaps be concealed for two or three weeks in case it is very important that the initial installation and firing be secret. This involves great labor and use of material. The following camouflage measures are practicable for protecting railway artillery:

a. Cover firing position with enough material so that the enemy never can see whether the gun is or is not in position.

b. When overhead concealment for the approach track is lacking but the battery itself can be hidden, it is sometimes desirable to make a dummy extension of the approach track to a dummy position 400 to 800 yards from the battery. Two dummy positions, one camouflaged carelessly but not too obvious and the other very carefully to look like a real position, are effective.

c. Camouflage for railway armament may be designed to make the pieces represent ordinary rolling stock, dump cars in a gravel pit, or storehouses at the end of a railway spur.

d. When concealment is impossible, several alternative positions may be arranged with overhead screens to prevent the enemy from detecting which of the positions is actually occupied. If the armament is moved into firing position only when required for immediate action and then only under cover of darkness, and if proper use is made of camouflage with suitable provisions for flash and smoke deflade, the enemy will encounter extreme difficulty in determining location of positions. This difficulty will retard accomplishment by him of effective counterbattery fire. Smoke boxes and other devices for forming smoke screens may be found advantageous for restricting enemy observation of the firing position, particularly during his counterbattery action.

■ 135. CONCEALMENT OF TELEPHONE LINES.—In wiring in battery positions for local security, in erecting telephone lines or digging cable trenches, and in locating the straight edge of a camouflage net, try to keep under natural overhead concealment. If this is not available, use natural lines of cleavage such as the boundary between meadow and cultivated ground, hedges, or stone walls.

■ 136. DUMMY INSTALLATIONS.—Construction of dummy positions will aid in concealment of true positions. Dummy batteries and base-end stations should be erected in places at least a quarter of a mile from genuine installations so that the fire attracted will not injure elements of the defense. This work must be done with care and evidence of activity such as paths, blast marks, flashes, and smoke must be simulated. Two dummy positions are better than one.

■ 137. AMMUNITION DUMPS.—Ammunition dumps are usually obvious not only because of their size but because of heavy traffic in their vicinities. Unusual activity such as construction of new dumps or replenishment of old ones may disclose intended operations. Dumps should be so located and built that they are accessible, that the engineering work involved is kept to a minimum, and that location from the air is difficult. They should utilize natural concealment and cover if practicable and ammunition piles should be spaced irregularly. Original roads should be used or new ones camouflaged if visible from the air.

■ 138. TRACTOR PARKS, KITCHENS, AND BATTERY PERSONNEL.—

a. A battery is most often disclosed by signs of activity around it. Tractor parks should be far enough removed so that enemy shells intended for the battery will not damage the tractors, and so that discovery of the tractor park will not disclose the gun positions. Tractors should be at least 500 yards from the gun position.

b. From the camouflage point of view, the best practice is to maintain at the gun position only the men actually required to fire the guns. The remainder, with kitchens and dugouts, should be kept at the rear echelon 500 yards or more from the battery position wherever the best concealment and cover are available.

c. Other troops should not be permitted to bivouac near a battery position if it can be avoided as it is almost impossible to maintain effective camouflage discipline about a battery position where troops of different units are mixed.

■ 139. MATERIALS AND ERECTION OF CAMOUFLAGE.—*a. Natural vegetation* can be used to give excellent camouflage provided it is cut at points remote from the battery, supported in its natural upright positions, and replaced before the leaves wither. Small trees may be set up in pieces of pipe or cans and guyed into erect positions. Trees and bushes may be suspended from above to give a natural effect. Cut branches laid flat or grass thrown loosely over an object give no concealment unless a whole field is covered, as vegetation laid flat reflects light and is very conspicuous from above. Employment of vegetation is limited by the natural growth in the locality. On open beaches only local brush should be used and little of that. Where batteries are emplaced among buildings a dummy roof over each gun position may provide the best camouflage.

b. Wire or nets.—Chicken wire is heavier and more bulky than fish net but it holds its form better and is more durable. It is more readily obtainable commercially and is preferable for permanent or semipermanent positions. The wire should be dulled by passing it through a smoky fire before attaching the burlap and should be stretched tightly. A sagging camouflage net as seen from above looks like a round hole.

c. *Oil paints* make burlap very inflammable and glisten when wet. The special paints furnished by the Corps of Engineers should be used.

d. *Outlines and shadows*.—Edges of nets should be hidden along such natural lines as hedges, roads, paths, or ditches. If no such lines are available, extreme irregularity of edges becomes necessary; not irregularities of 2 to 6 feet, but of 20 to 30 feet. Also, an essential idea in weaving nets with burlap is to thin the material irregularly toward the edges on a large pattern in order to avoid a regular outline or visible shadow. The object sought is a bristly texture with contained shadows on top fading irregularly to transparent edges. Activities must be kept under the thicker portion. Garlands (knots of burlap) may be tied on the guy wires to prolong irregularities beyond the net (see fig. 6).

e. *Roads, tracks, or paths* are concealed by patches and irregular figures of netting and not by vertical strips parallel to the path. Concealment of long roads or paths in the open is so difficult that it is usually better to prolong them to some other locality on a flank. Paths in the woods that are visible from above may be masked by drawing together the limbs of trees to make them overhang. Cut branches or shrubs may be suspended from ropes to thicken the mask.

f. For further details see FM 5-20.

■ 140. SUPERVISION AND DISCIPLINE.—a. *Supervision*.—Camouflage must be judged from the enemy point of view. Concealment from ship observation can be properly studied only from positions offshore. Concealment from aerial observation and photography likewise can be judged only by observation and photography from the air at various hours of the day. Frequent flights should be made over camouflaged areas to check efficiency of measures used and camouflage discipline.

b. *Discipline*.—Next to proper choice of position, camouflage discipline is the most important factor in effective value of camouflage. Camouflage discipline involves confining movements to designated routes, keeping blast marks constantly concealed, closing embrasures when not firing, repairing or changing covering material when necessary, keeping men under concealment when enemy airplanes are overhead,

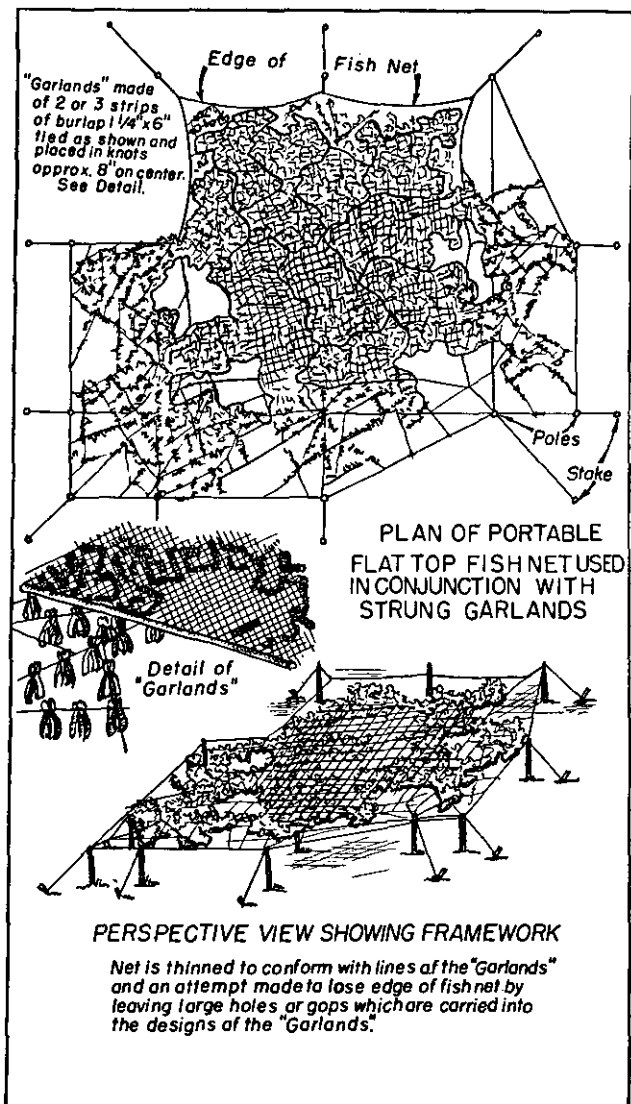


FIGURE 6.—Flat top camouflage.

not allowing smoke to appear near the battery, keeping ammunition covered, not allowing ammunition trucks or other vehicles to stop in daylight on the road near the battery and not permitting transportation to turn around near the battery position. Confining movements of personnel to designated routes is the requirement most difficult to enforce. Under fatigue and strain of active conditions, only the most thoroughly trained personnel can maintain effective camouflage discipline. The plan for enforcement of camouflage discipline must include roping or wiring in of open paths and trails and camouflaging them where necessary, and requiring all personnel to remain under concealment so far as practicable.

SECTION III

COVER

■ 141. GENERAL.—By cover is meant means employed for prevention of injuries to personnel or matériel. Cover is essential for protection against the shattering effect of shells or bombs and against the splintering and penetrating effect of fragments of such missiles or of small caliber projectiles. Complete protection requires an enormous amount of time and labor which would not be furnished unless definitely needed over a considerable period of time. Comparatively simple structures are built first and improved as necessity requires and time allows. Light overhead cover is of value only as protection against weather. Complete overhead protection for the pieces and the personnel serving them is not practicable since 17 feet of undisturbed earth or equivalent heavy construction is required for protection against a 6-inch shell. For details of construction of overhead and other cover, see FM 5-20.

■ 142. COVER FOR FIXED SEACOAST ARTILLERY.—With increased range and caliber of naval guns and development of powerful airplane bombs, complete protection of heavy, fixed seacoast artillery by bombproof construction has become impracticable. At the present time its chief reliance for minimizing effect of enemy fire must be placed on concealment and separation of the guns or on turret type emplacements with bombproofing

for certain essential elements only, such as plotting rooms, switchboards, magazines, and power plants.

■ 143. COVER FOR TRACTOR-DRAWN SEACOAST ARTILLERY.—The amount and kind of cover required for tractor-drawn seacoast artillery in mobile positions vary with natural and artificial concealment available, activity of the enemy, and location of the firing battery. All cover must be concealed to prevent detection by enemy air observation, and there frequently is a limit to the amount of concealed cover that can be constructed. In a well-concealed temporary position, extensive cover is neither necessary nor practicable. However, when a position is to be occupied for some time, the amount of cover should be consistent with the protection desired.

a. Battery positions.—(1) As soon as possible after occupation of a position or prior to occupation if the situation permits, work is started on narrow slit trenches for the cannoneers. These trenches may be dug between intervals of firing or at the first available opportunity. They are sited so that men at the piece can enter the trenches promptly and also be ready to return to their active positions at a moment's notice. They are as close to the gun as service of the piece will permit, care being taken that they will not interfere with the trail when the direction of laying is changed. Normally, a short trench is dug on each side of the piece. They are as narrow as will permit a man to enter. Trenches 2 feet wide, 3 to 5 feet deep, and 15 feet long are satisfactory for the 155-mm gun.

(2) Earth excavated from the trench is thrown up to form a parapet around the trench to protect matériel and personnel. The parapet to give cover to the cannoneers should be not less than 4 feet high, and to be splinterproof should be not less than 2 feet 6 inches thick at the top.

(3) Communication trenches for ammunition supply and for access to and from the position should be constructed, and later if time permits bombproofs for personnel. In general, all bombproofs should be gasproofed.

b. Command and observation posts.—(1) While troops are preparing emplacements at gun positions, other details prepare command posts, plotting rooms, and observation posts.

In a hasty position, the command post may consist of a trench to contain personnel if buildings or other natural cover are not available. A trench 3 feet deep, with a parapet 1 foot 6 inches high, gives cover to men in a sitting position. For the standing position the depth should be increased to 5 feet. The standing trench may be made splinterproof by covering it with a layer of logs and at least 1 foot of earth. For continued use over a period of time, a bombproof structure should be provided for the command post. This structure to afford shelter to withstand a 6-inch shell requires 17 feet of undisturbed earth or 5 feet of plain concrete.

(2) Unless the plotting room is included in the command post bombproof shelter a separate bombproof should be furnished for it as soon as practicable. Initially the plotting details may have to function under concealment only, but because of the absolute necessity for efficient plotting for moving target firing, the plotting room is given high priority in allotment or construction of cover.

(3) For observation posts for base-end stations, concealment may be the only protection in the initial stages of occupancy. If fortified the observation post should be made splinterproof and bombproof shelter for personnel constructed in the vicinity.

■ 144. COVER FOR RAILWAY ARTILLERY.—Cover for the firing position should be provided wherever practicable by properly locating the position upon a reverse slope and by taking full advantage of protection offered by railway cuts and other similar features. In every case consideration must be given to requirements for effectiveness of fire and to concealment. Overhead cover for shelter of personnel should be constructed in the vicinity of the firing position, but sufficiently removed therefrom or of ample strength to insure protection from enemy fire directed against the firing position. Cover trenches should be constructed in the immediate vicinity of each emplaced piece to provide emergency protection for the gun crew. During long periods of continuous occupation it will be found advisable to extend these cover trenches so as to provide protection for personnel when entering or leaving the position while under fire. In all cases extent and char-

acter of cover constructed are governed by the probable length of time the firing position is to be occupied, and by the character of enemy fire to be expected.

SECTION IV

PROTECTION AGAINST AIR AND CHEMICAL ATTACK

■ 145. DEFENSE AGAINST AIR ATTACK.—*a.* Defense against air attack is provided by camouflage of battery positions, observation posts, command posts, searchlights, and other elements; natural or artificial cover for personnel; fire of antiaircraft armament; friendly pursuit aviation; balloon barrages; and smoke.

b. Responsibilities of the battery commander are to—

- (1) Improve camouflage.
- (2) Insure instant alerting and action by crews of the battery antiaircraft machine guns.
- (3) Maintain constant and rapid communication with local antiaircraft artillery elements.
- (4) Provide cover close to the guns so that personnel losses from air attacks will be reduced.

■ 146. DEFENSE AGAINST CHEMICAL ATTACK.—Chemical attacks on seacoast artillery positions may be in the form of gas shell or by spray or bombs dropped from airplanes. They may be made to harass personnel and reduce efficiency of its fire by forcing wearing of masks or by causing casualties. The enemy may be expected to use mustard gas. Battery personnel should be supplied with gasproof clothing and masks. Problems peculiar to seacoast artillery are—

a. Difficulty of observation and telephone communication by observers, spotters, and gun pointers while wearing the mask.

b. Necessity for gasproof clothing for crews of seacoast batteries. In many situations this armament cannot be moved to alternate positions outside the gassed area.

c. Necessity for careful training of individuals to avoid mustard gas burns from handling infected matériel after gas attacks.

d. Need for training all members of the battery in performance of combat duties while wearing gas masks and impregnated clothing.

■ 147. DETAILS OF GAS DEFENSE.—For details of defense, see FM 21-40.

■ 148. COLLECTIVE PROTECTION.—*a. Gasproofing.*—Collective protection is of particular importance to seacoast artillery troops, and more practicable for them than for troops of the more mobile arms. Gasproof plotting rooms will allow range sections to work without masks. Rest shelters where men may remove gas masks and protective clothing during quiet periods should be splinterproofed. For fixed batteries most of these rooms are within the emplacement; in other cases underground shelters may be required. Ventilation may be provided by motor-driven fans or blowers which remove the gas by drawing air in through large filters. Kitchens, hospitals, and food stores should be kept a mile or two distant from the batteries to reduce requirements for gasproof shelters.

b. Aerial gas attacks.—When only aerial gas attacks are feared troops may be kept well away from the batteries until hostile naval vessels appear in the vicinity. Casualties may be avoided during preliminary air raids by keeping only anti-aircraft detachments and disinfecting squads at the battery positions.

c. Gassed areas.—When an area has been drenched heavily with mustard gas mobile batteries should withdraw to alternate positions outside the area at the first opportunity. For fixed batteries the area may have to be decontaminated. Handwheels, rammer staves, shot trucks, shot truck handles, powder storage cases, and all matériel which has to be handled must be carefully cleaned. Loading platforms must be washed with approved solvents. Paths to the battery and craters or areas likely to retain gas must be decontaminated. If chloride of lime is used special precautions must be taken to prevent making the battery conspicuous in this way. Bathing facilities should be available to men after exposure to vesicant gases.

■ 149. USE OF SMOKE.—*a. By attacker.*—The enemy may neutralize batteries by using smoke, either as a smoke cur-

tain laid by a plane or by smoke shell or bombs, in front of batteries or stations. Antiaircraft fire should be concentrated on planes laying smoke curtains. Batteries should be ready to use indirect fire. Base-end stations should be located well away from batteries and carefully concealed to prevent neutralization by smoke.

b. By defender.—The defense may use smoke to mask conspicuous objects which cannot be camouflaged, but care must be taken that such smoke will not interfere with observation and fire of the defense.

SECTION V

AUTOMATIC WEAPONS DEFENSE

■ 150. GENERAL.—Machine guns are assigned to all firing batteries of mobile seacoast artillery for their defense against neutralization or destruction by hostile aviation and their close defense against raids or landing attacks. In a harbor defense both machine guns and 37-mm antiaircraft guns are allocated to the harbor defense for similar purposes.

■ 151. PLANS FOR EMPLOYMENT.—Plans for employment of an automatic weapon in any particular unit or harbor defense will depend on its location, presence, and employment of antiaircraft artillery units, and plans and orders for local defense. Many seacoast batteries, power plants, fire-control stations, or other defense elements are so located that the problem of their defense, both antiaircraft and land, is almost entirely a fort or groupment problem. In other cases isolated batteries or stations will require their own defense and will constitute strong points organized for all around defense. Whenever possible the whole scheme of automatic weapon defense should be coordinated by higher authority. It should always be coordinated between adjacent units within supporting distances.

■ 152. POSITIONS.—*a. General.*—Automatic weapons are posted in accordance with plans outlined and with consideration as to whether the gun is intended primarily for antiaircraft defense, land defense, or both.

b. Antiaircraft defense.—(1) For antiaircraft defense in a harbor defense automatic weapons normally are sited with a

view to establishment of an area defense within which certain vital or more vulnerable sections may be given greater protection than others. Machine guns of mobile seacoast artillery batteries operating within a harbor defense will normally be controlled under the specific harbor defense plan for antiaircraft defense of the area. Machine guns of mobile units outside harbor defenses will be sited for battery or area defense, depending on the distribution of all batteries in the area.

(2) Where isolated location of harbor defense or mobile elements requires local protection of such elements machine guns should be sited 100 to 200 yards and 37-mm guns 200 to 500 yards from the element defended, actual locations being determined by the terrain. 37-mm guns normally should be sited in fire units of two guns. Machine guns may be sited in fire units of four guns, in pairs, or singly around the element to be protected, depending on terrain and number of guns available. Central control equipment should be utilized with 4-gun fire units. This equipment normally will not be available for machine gun fire units of less than four guns.

(3) All automatic weapons positions should be concealed from air observation.

c. Land defense.—For land defense machine guns should be sited to fire on the principal line of approach of hostile forces so as to delay and harass the enemy, to place flanking bands of fire in front of lines of resistance and along obstacles to cover beaches and landings, and to cover ground from which hostile forces can view or annoy batteries or stations. Within isolated strong points they should be sited for all around defense in order to concentrate fire on favorable targets and to defend against attack from any direction. Machine guns should always be protected by obstacles, emplacements, and local combat groups. When machine guns have the dual mission of antiaircraft and land defense they should be posted when possible where they can execute both missions. When this is not possible alternate positions must be prepared.

d. Positions of 37-mm guns should be selected mainly because of their suitability for antiaircraft defense fire. From such positions with its depression limited to 0 degrees, the 37-mm gun may be used on suitable land targets, particularly in defense against mechanized units.

SECTION VI

LOCAL SECURITY

■ 153. GENERAL.—*a. Definition.*—Security as applied to seacoast artillery is the all around protection of a command by adoption of effective measures to prevent surprise and interference by the enemy and to minimize effect of an attack from the sea, land, or air. Necessity for security is basic in every action in war from the time of the first possible encounter to the final battle, and must be uppermost in the minds of commanders of all echelons. Every commander is responsible at all times for the security of his command.

b. General considerations.—Location of seacoast batteries comparatively near the shore line and frequently on islands or in other isolated localities makes local security a vital problem. In many cases no troops other than seacoast artillery units will be present, and the latter must then furnish beach defense in addition to carrying out their normal duties. As a rule the harbor defense commander is always responsible for land, beach, and air defense of his harbor defense area, and would control reinforcements of other arms made available to him for land or beach defense. Only when his harbor defense is a part of a theater of operations in which higher authority has specifically placed on other troops the responsibility for beach defense is he relieved from this responsibility. In any event seacoast artillery units are responsible for their own close in defense and security. Hostile landing and raiding parties can approach quickly and silently at night or under cover of fog or smoke, hence measures for complete security must be taken at the outbreak of war and continued with unceasing vigilance.

■ 154. MEANS OF ATTAINING SECURITY.—*a. Information.*—Timely, accurate, complete, and continuous information of enemy dispositions, composition, strength, and capabilities is the most important means of attaining security against surprise. Prior to war certain information of the enemy may be obtained through espionage and peacetime intelligence operations. After commencement of hostilities these means are supplemented by various other intelligence agencies. A

prompt flow of essential information requires combined action of air, sea, and ground reconnaissance agencies, and gaining early contact with hostile forces.

b. Concealment.—The most effective means of minimizing effect of hostile attack is concealment from hostile observation. This is accomplished by careful choice of positions, maximum use of natural or artificial cover, camouflage and camouflage discipline, avoiding premature disclosure of gun and searchlight positions, and without interfering with accomplishment of artillery missions, use of smoke.

c. Organization of ground.—Security against landing or land attacks and protection of the command from air, sea, or ground bombardment is greatly increased by thorough organization of the ground. This would include construction or improvement of obstacles, clearing of fields of fire, selection and preparation of defensive positions, and construction of splinter, bomb, and gas proof shelters. For mobile seacoast artillery organization of the ground, which may have to be hasty, may be simplified by careful choice of positions, provided that emphasis is still placed on suitability of positions for performance of artillery missions. For fixed defenses organization of the ground should be completed as far as practicable in peacetime.

d. Beach defense consists of a series of organized tactical localities in rear of those sections of the shoreline where landings are probable, and so situated that defenders can place machine-gun fire on the beach and the intervening terrain. It includes barbed wire or other obstacles placed on the shore or under the water. If mobile forces are present for defense of a section of the coast against a strong landing attack, beach defense will include other defensive lines rearward from the shore constructed by these forces after their arrival. Initially such troops may not be present, in which case harbor defense troops may have the mission of organizing and furnishing beach defense in the vicinity of the seacoast artillery installations. As a beach defense manned by harbor defense troops ordinarily will have for its purpose defense against minor raids only, organization in great depth is not essential.

■ 155. PHASES OF SECURITY.—Security operations of a sea-coast artillery command must provide security against any of numerous possible hostile activities. These security operations may be divided into two phases, counterreconnaissance phase and resistance phase. However, because of the rapidity with which naval and air forces may be assembled and maneuvered, it may be necessary at the beginning of hostilities to provide all the security measures required during the resistance phase.

a. The counterreconnaissance.—The counterreconnaissance phase begins with opening of hostilities and continues to the time when the enemy dispositions are such that a strong hostile attack may be launched. During this phase the enemy will attempt to discover strength and disposition of defensive forces. Hostile reconnaissance may be conducted by aircraft, cruisers, destroyers, and submarines, and may include action by espionage agencies and by patrols landed from hostile vessels. The enemy may confine his activities to observation, he may include activities designed to draw defensive fire, and he may include activities of mine sweepers to locate and clear mine fields. Landing raids may be attempted with reconnaissance, harassing, or destruction missions. Attempts at sabotage by enemy sympathizers may be expected.

b. Resistance.—The resistance phase begins when the enemy dispositions are such that a strong hostile attack may be launched. During this phase all the enemy operations listed under the counterreconnaissance phase may be continued and in addition strong sea, air, and landing attacks may be conducted by full hostile naval strength.

■ 156. PRECAUTIONS AGAINST SURPRISE.—Special precautions must be taken against sabotage and to avoid surprise by raiding parties. These usually include—

a. Fullest possible use of intelligence and communication systems of the command.

b. Patrols to cover bridges, swamp crossings, or other lines of approach to the fort or batteries.

c. Beach patrols on adjacent landing beaches if not covered by other troops primarily responsible.

d. Preparations for close defense of batteries and stations including defense against troops transported by aircraft.

e. Underwater listening devices.

f. Small patrol boats equipped with radio or visual signals.

■ 157. PREPARATIONS FOR CLOSE DEFENSE.—*a. Batteries.*—Preparations for close defense of batteries should include—

(1) Erection of obstacles on shore and under water.

(2) Selection of sites for automatic weapons, allowing enfilade fire on approaches or bands of fire along obstacles.

(3) Provisions for prompt and effective use of small arms and grenades.

(4) Training of battery personnel in occupation of positions for local defense.

b. Auxiliary elements.—Isolated base-end stations and searchlights are particularly vulnerable. Local protection for searchlights may be furnished by nearby observing details. Automatic rifles are often assigned to observing details and command post details for their local protection. Mining casemates, power plants, cable huts, switchboard rooms, and storehouses require watching. Where necessary, they should be surrounded by barbed-wire entanglements. Exposed communications such as unburied fire-control cable or exposed cables from casemates to mine fields are subject to attack. Remote or isolated elements require special camouflage discipline and strong security detachments. Closely grouped elements may be secured by interior guards.

c. Sabotage.—Counterespionage measures and precautions against sabotage are essential.

■ 158. BEACH DEFENSE PREPARATIONS.—When hostile landing raids or landing attacks in force are probable preparations by seacoast artillery troops may include organization of beach defenses in the vicinity of their artillery installations. In addition to this beach defense organization and prior preparations for close defense, harbor defense commanders will—

a. Continue close liaison and coordination with supporting naval and air forces.

b. Enforce all precautions against surprise.

c. Arrange for fire of available batteries on beaches, routes of approach, and in front of defensive positions.

d. Prepare to illuminate critical sections of the beach.

SECTION VII

DEFENSE AGAINST MECHANIZED UNITS

■ 159. GENERAL.—In warfare there is constantly present the possibility of attack by mechanized units which may be used by the enemy on reconnaissance missions, on raids to destroy important installations or to harass the opponent or disrupt his communication system, or in support of an attack by other forces. Although in coastal frontier defense threat of a mechanized attack may not be as apparent as in open warfare, it is to be expected that landing operations conducted by any considerable force will include employment of mechanized units. Light mechanized vehicles may be present in the early landing waves, and a force successfully landed probably will be reinforced promptly and heavily by mechanized units. All commanders must provide for antimechanized defense of their commands, measures taken for this defense being carefully coordinated and all available means being included in the defense plan. For further details see FM 5-30. In general no command should be exposed to mechanized attack without every reasonable measure having been taken for its protection.

■ 160. SITING OF ANTIMECHANIZED WEAPONS.—*a.* Full use of natural and artificial obstacles is planned and antimechanized weapons should be sited accordingly, some to cover obstacles but the bulk to cover available avenues of approach. Seacoast artillery in harbor defenses normally will have both .50-caliber machine guns and 37-mm guns for defense. Mobile seacoast artillery will have only the .50-caliber machine gun. As these weapons are basically for antiaircraft defense and defense against landing attacks, choice of positions may require careful consideration, and coordination by higher commanders may be necessary.

b. Requirements of a suitable position for antimechanized guns are good fields of fire at ranges up to 1,000 yards, possibilities of flanking fire, protection against direct mechanized attack, covered routes to firing position, availability of alternate emplacements which can be occupied quickly by manhandling the gun, and nearby cover for ammunition. However, as a change of position under hostile fire may not be

practicable, the position should permit shifting fire to any direction from which attack may be probable.

■ 161. FUNCTIONING OF DEFENSE.—As timely warning of mechanized attack permits increased readiness for action, all observation and reconnaissance agencies are required to make immediate reports of mechanized threats to the nearest commander. Operations of such agencies should be in directions of the most probable mechanized attacks, but because of rapidity of movement of mechanized forces all possible routes of approach must be observed. Initial delay of mechanized units at some distance from the harbor defense or mobile battery positions may be vital to successful shifting of local defense.

CHAPTER 10

TACTICAL EMPLOYMENT OF HARBOR DEFENSE

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SECTION I

EMPLOYMENT OF SEACOAST ARTILLERY IN HARBOR DEFENSE

■ 162. SCOPE.—This section covers the considerations peculiarly applicable to employment of seacoast artillery in a harbor defense. For a discussion of the general considerations governing fire direction against naval targets and of positions for seacoast artillery, see section V, chapter 7, and section II, chapter 8, respectively.

■ 163. FORMS OF ATTACK AGAINST HARBOR DEFENSES.—Forms of attack which usually will be employed against a harbor defense are—

- a. Reconnaissances and feints.
- b. Naval raids.
- c. Bombardments.
- d. Mine laying off harbor entrances.
- e. Attacks on mine fields, nets, booms, and other obstacles.
- f. Blocking attacks.
- g. Torpedo fire into harbors.
- h. Naval attacks in force; penetrations; attacks on our naval forces.

■ 164. RECONNAISSANCES AND FEINTS.—*a. Reconnaissances.*—Reconnaissances include those operations designed primarily to locate various elements of defense such as mine fields, nets, searchlights, batteries, casemates, switchboard rooms, cable landings, and command and observation posts. These operations normally will be conducted by aircraft, destroyers, or submarines. It is probable that an enemy will be in possession of information as to location of some of our batteries, espe-

cially those of a fixed type, and that it may be unnecessary for him to make a reconnaissance for the purpose of locating these elements. Where presence of railway artillery is suspected, however, a reconnaissance may be made to determine its location, and similar action may be taken subsequent to a bombardment for the purpose of determining its effect.

b. Feints.—Feints or demonstrations in connection with an attack against a seacoast have as their missions diversion of the defender's reserves from the area of main effort, or retarding movement of his reserves thereto. Feints preliminary to an attack on a particular harbor defense include those operations designed primarily to annoy and fatigue the defender, to lower his morale, and to decrease his efficiency as much as possible by causing him at frequent and irregular intervals to man his stations in expectation of an action. These operations probably will include demonstrations by destroyers or submarines at ranges near the outer limits of the shore secondary armament, including occasional smoke screens laid by destroyers.

c. Time.—A reconnaissance may be made either by day or by night, depending upon its purpose. Feints may be expected at irregular intervals throughout the day or the night, particularly when other operations are imminent.

d. Action against.—In general, during feints and reconnaissances only those seacoast batteries whose location probably would be known to the enemy should be brought into action. Unless opportunity is offered for destruction fire, one or more batteries of secondary armament may be designated advantageously for use in preventing the enemy from approaching to close range. At night use of searchlights should be kept to a minimum.

■ 165. NAVAL RAIDS.—*a. Purpose and conditions under which made.*—Naval raids by destroyers or other fast craft or by submarines may occur in early stages of war, or may initiate hostilities when possible results of such abrupt action might be great and risks small. These raids would be directed against important harbors or bases for destruction of naval facilities of special importance or against naval or other vessels at anchor within harbors. While they may be made in the daytime, they more probably will be made at night

when conditions are most favorable for effecting a penetration into a defended harbor. Naval raids also may be expected against less important harbors in later stages of war when it is desired to draw attention from more important hostile operations elsewhere or to cause dispersion of our forces by a popular clamor for protection of localities unimportant from a military point of view.

b. Similarity between raids and reconnaissances.—Reconnaissances by hostile naval forces seeking information of defensive dispositions may appear to the defense as operations similar to raids. Both may be accompanied by small landing raids made secretly under cover of darkness or fog or openly supported by fire from naval vessels.

c. Protection against.—Mines, nets, booms, and other obstacles when installed act as deterrents to such operations by light surface craft and submarines running on or below the surface, but the chief reliance for protection against surface vessels is in the seacoast gun.

■ 166. BOMBARDMENTS.—*a. Purpose.*—Bombardments may be undertaken for the purpose of inflicting material damage on important seacoast cities, destroying naval docks or other important naval utilities, attacking naval or commercial craft at anchor within a harbor, silencing important seacoast batteries, or covering landing operations involved in a joint attack.

b. Time and conditions under which conducted.—Bombardments may be undertaken either by day or by night. They may be conducted at ranges beyond the effective range of most of the seacoast artillery or they may be conducted at shorter ranges, in which case the enemy may utilize smoke screens laid by his ships or his airplanes in order to render difficult observation and effective fire by the shore guns.

c. Effects of bombardment.—Because of difficulties incident to observation of naval indirect or long-range direct fire against land targets, limited ammunition-carrying capacity of ships, very considerable expenditures of ammunition required to obtain direct hits upon small land targets, and the fact that ammunition normally carried by ships is not well-suited for attack of land targets, it is probable that seacoast artillery will suffer but little material damage from naval

bombardments even of a prolonged character. However, against cities, ships at anchor in a restricted harbor, and similar area targets bombardments may be of considerable effect under favorable observation conditions.

d. Action against.—In general, seacoast artillery should employ its primary armament for fire for neutralization or destruction, depending on whether or not the enemy capital ships are beyond or within ranges at which destructive effect can be expected without prohibitive expenditure of ammunition. In any case, the largest possible number of hostile ships capable of firing effectively on defended objectives should be taken under fire. If smoke screens are used by the enemy, the secondary armament should be employed against the ships laying the screens.

■ 167. MINE LAYING OFF HARBOR ENTRANCES.—*a. Conditions under which made.*—Hostile naval forces may attempt to lay contact mine barriers off some of our harbor entrances in order to prevent debouchment of our naval vessels or to restrict their maneuver when they leave the harbor, or to interfere with commercial shipping entering and leaving the harbor. Such operations probably will be conducted under cover of darkness, fog, or smoke screens.

b. Action against.—Ordinarily fire of sufficient secondary armament should be directed against mine layers to prevent accomplishment of their mission. Vessels laying smoke screens to cover mine-laying operations should be taken under fire by sufficient rapid-fire batteries to prevent accomplishment of the screening mission.

■ 168. ATTACKS ON MINE FIELDS, NETS, BOOMS, AND OTHER OBSTACLES.—*a. Conditions under which made and protection against.*—Presence of mine fields and nets will restrict movements of the enemy and will generally serve to prevent his passage until they can be removed. As will ordinarily be the case, where they are covered by gunfire their removal during daytime will generally be impracticable, and operations for that purpose may be expected at night. Reliance for protection against such attacks, consisting of sweeping operations by mine sweepers or other second line vessels, must be placed chiefly upon gunfire of rapid-fire armament.

b. Use of barrage or zone fire.—Where illumination is impracticable, use of prearranged barrage or zone fire of rapid-fire armament over approaches to mine fields or nets will be indicated. In view however of the considerable amount of ammunition required in order that such fire may be effective, its use should be restricted to occasions when presence of the enemy within a limited area is definitely established.

■ 169. BLOCKING ATTACKS.—Under certain conditions it may be advantageous to the enemy to block narrow harbor exits by sinking therein vessels of a commercial type, naval auxiliaries, second-line naval vessels, or other suitable vessels of large size. Such attacks are more probable under cover of darkness or fog. In view of the necessity for sinking such vessels before they reach their objective and because these vessels often will be of unprotected types, normally all available armament should be concentrated upon blocking vessels as soon as their presence is detected.

■ 170. TORPEDO FIRE INTO HARBORS.—In some situations ships lying at anchor inside a harbor may be exposed to attack by torpedoes fired by ships outside the harbor entrance. Defense against such attacks will be provided by rapid-fire guns, and by torpedo defense nets and booms.

■ 171. NAVAL ATTACKS IN FORCE; PENETRATIONS; ATTACKS ON OUR NAVAL FORCES.—*a. Conditions under which made.*—Use of first-line capital ships against seacoast artillery defending a harbor for the purpose of seizing the harbor as a base or of capturing or destroying naval forces, naval utilities, or shipping therein, will not be probable before the enemy has obtained at least temporary control of the sea. Although improbable, a situation may arise wherein the enemy will expose his capital ships to fire of seacoast artillery before gaining control of the sea. Such a situation might occur when the mission of the hostile naval force is to capture an important strategic harbor at the outbreak of war, or before the defense can be fully mobilized; to attack a weaker naval force protected by seacoast guns before it can be reinforced; or to attack our fleet while it is entering or debouching through a narrow passage.

b. Possible combinations of action accompanying attack in force.—An attack in force against harbor defenses may be accompanied by a landing in force. The naval attack may include all or various combinations of the forms of naval attack referred to in paragraph 163, either simultaneously or separately. In particular it may include reconnaissances and feints, mine and net sweeping operations, air attacks, and bombardments. It may include an attempt to run by defending artillery, but such an operation will probably be confined to situations where the objective is one of great value, where hydrographical conditions are favorable, and where attacking vessels after passage will be beyond range of artillery of the harbor defenses, or when naval preponderance is such that forts taken in reverse may be overwhelmed by naval fire. However, an operation of major proportions would probably be undertaken only if control of the air for the period necessary for accomplishment of the mission were assured.

c. Action against an attempted run-by.—Neutralization fire has no place in the defense against a penetration or run-by. Fire for destruction should be opened on the leading ship or ships, depending on the amount of artillery available, as soon as they come into range. This fire should be continued as long as enemy ships are within range.

d. Supporting mission of harbor defense.—One of the important missions of a harbor defense is to afford protection to our own fleet in entering or debouching from a harbor. This may involve action against capital ships, cruisers, destroyers, and submarines. As a rule, as many as possible of the hostile ships should be taken under fire. Particular attention should be given to hostile capital ships and other enemy vessels which, by reason of advantageous position, constitute the greatest threat to our own naval force. In some situations it may be necessary to place a heavy concentration of fire on such ships, though some of the more remote hostile ships may have to be uncovered.

■ 172. COORDINATION OF ARTILLERY FIRE.—To obtain and maintain maximum efficiency of all artillery in a seacoast artillery command much planning and advanced training are required. Batteries well trained in gunnery require addi-

tional training to make them efficient members of an effective fighting team. Commanders must know and train their commands in proper tactical employment of seacoast artillery.

a. Proper concentration and distribution of fire is best maintained when the normal chain of command is unbroken, but all commanders should know the doctrines to be followed in event of severed communications. When practicable all commanders should be appraised of contemplated or ordered action on the part of other elements of the command, as this knowledge will assist them should independent action on their part become necessary.

b. Commanders must know capabilities and limitations of their armament and conditions under which their various weapons will be most effective. Continuing consideration should be given to amount and type of weapons to be employed under existing conditions. Use of more armament than is reasonably necessary to accomplish desired results should be avoided. It is better to gain desired volume of fire by firing one unit at full rate than by firing two units at half rate. During the initial phase of fire adjustment, overconcentration should be avoided, as it may make actual adjustment difficult if not impossible.

c. Under normal conditions and chain of command, the higher commander in assigning a mission should not specify how that mission is to be accomplished by the lower commander. A group commander, for instance, given a definite mission, might under certain circumstances open fire on a single target with all of his batteries, or he might properly prefer to employ initially only one battery and await a more favorable opportunity prior to employing his full fire power. This latter method of fire direction could have application under conditions of poor visibility, when targets are at extreme ranges of the armament, or in zones where perforative hits are doubtful. Target assignment to batteries should be made with a view to facilitating shifting fire.

d. Every effort should be made to expedite commands. This can be done to some extent by drafting a series of action orders to cover more probable actions that may be required through employment of various combinations of probable targets and existing batteries (see par. 306). Such action

orders should be limited in number and simple to understand and execute, and should be promulgated in "The Coordination of Artillery Fires Annex." When practicable, information and instructions for coordination of artillery fires should be drawn up in chart or diagram form and posted in the various command posts for quick reference and employment in battle.

SECTION II

EMPLOYMENT OF SUBMARINE MINES AND OBSTACLES

■ 173. FUNCTIONS OF SUBMARINE MINES.—Functions of submarine mines, controlled or contact, are to—

a. Effect destruction or serious damage of hostile vessels entering the mine field.

b. Prevent close approach or entry into a harbor of hostile surface vessels under cover of night, fog, or smoke, when other weapons of the Army or the Navy are wholly or partially ineffective.

c. Limit or prevent navigation of certain water areas or channels by hostile submarines.

d. Restrict freedom of maneuver of hostile vessels in formation.

e. Enforce, by moral effect of unseen threat, constant caution and an element of uncertainty in planning and execution of all hostile naval operations in water areas known or believed to be protected by mine fields.

f. Give indication of hostile submarine activities or the presence of hostile surface vessels in a mine field.

■ 174. SUBMARINE MINE BARRIERS.—a. The *submarine mine barrier* in any one defensive coastal area comprises both controlled and contact mines employed therein. When both types of mines are employed, the barrier consists of controlled mine barrage and the contact mine barrage. Installation, maintenance, and employment of controlled mine barrage is a function of the Army. Contact mines are provided and installed by the Navy.

b. *Location*.—Mine barriers normally are placed clear of the seaward end of the harbor channel area and within effective range of searchlights located for their illumination. Use

of mines farther inshore is warranted only when conditions in the advanced position do not favor their employment there. In determining location of barriers, consideration should be given to the following factors:

(1) They must be located so that defended water areas will be effectively denied the enemy with minimum amount of mine matériel. This will require that barrages or other obstacles extend entirely across navigable waters of the harbor entrances. In wide defensive coastal areas it may be advantageous to employ both controlled and contact mines in the inner barrage, the controlled mines being employed to close the channels required for use by our naval forces and friendly shipping or a debouching area required by our naval forces. The contact mine barrage should be so located as to close navigable portions of defensive coastal areas which are not required by our naval forces and friendly shipping and to block off large areas or routes of access in deep water or far offshore. The controlled mine barrage should be located in depths of water not greater than 250 feet.

(2) Installation, maintenance, protection, and employment of contact and controlled mine barrages and other obstacles must be coordinated.

(3) They must be protected by secondary armament and installed within illumination range of the searchlights covering them, and should be located with a view to facilitating patrol surveillance, particularly under conditions of low visibility.

(4) They should be located where tidal currents are minimum and where protection from the sea is afforded as far as practicable.

(5) They should be located sufficiently far to seaward to prevent blocking the channel by a ship damaged by a mine, consideration being given to the fact that a ship damaged in this manner may travel a considerable distance after being struck by a mine. When it is impracticable to obtain a position for the inner barrage sufficiently far to seaward of the entrance to a narrow channel to prevent blocking of the channel by ships damaged by mines, or where currents and tidal variations are such as to cause excessive submergence of mines for extended periods, the protection to be derived

may be incommensurate with disadvantages and expense involved. Under these conditions it may be desirable to dispense with the inner barrage.

(6) Mines, both controlled and contact, planted against surface vessels are effective against submarines in not more than 40 feet of water. For mining against submarines in deeper water consideration should be given to planting successive lines of mines at different depths.

■ 175. **EMPLOYMENT.**—Characteristics of the two types of mines lead to consideration of the following fundamentals for employment of controlled and contact mines so far as harbor defense is concerned:

a. Controlled mines.—Controlled mines should be used to close such portions of harbor approaches as lead to channels required for use of friendly naval forces and friendly commercial shipping, or include a debouching area required by our naval forces. Controlled mine fields should be located in depths of water not greater than 250 feet.

b. Contact mines.—Contact mines should be used to close navigable portions of harbor entrances not required for use by friendly naval forces or commercial shipping and to block off large areas or routes of access in deep water or far offshore.

■ 176. **CONTROLLED MINE PROJECT.**—The controlled mine project is generally drawn up in time of peace and as a result of joint Army and Navy plans. Details are incorporated in authorized underwater-defense projects for the several harbor defenses. In formulation of this controlled mine project the following must be considered:

- a.* Location of mine fields.
- b.* Number, sizes, and types of mines.
- c.* Disposition of groups of mines within each mine field.
- d.* Availability and location of searchlights and guns for protection of mine fields.

■ 177. **CONDUCT OF MINE DEFENSE.**—*a. General.*—Conduct of mine defense based upon a predetermined project presents the following general problems:

- (1) Time and manner of planting project (mines and other obstacles).
- (2) Surveillance of mine field.

(3) Attack of hostile vessels.

(4) Protection of mine field.

b. Time and manner of planting project.—Each mine project will be planted when directed by the War Department or as provided in approved joint local defense plans.

c. Surveillance of mine field.—During hostilities surveillance of the mine field must be continuous throughout 24 hours of the day. This surveillance has three purposes: to form a basis for tactical decisions as to attack of hostile vessels; to insure that the mine field is rendered safe for passage of friendly naval forces and commercial shipping; and to insure protection of the mine field itself.

d. Attack of hostile vessels.—When a hostile vessel or naval force approaches the mine field, tactical decisions which must be made by the mine commander are whether to fire or to withhold fire, and if firing, whether to use observed, contact, or delayed contact method. Decision as to whether to fire or to withhold fire should be based on appreciation of the fact that whenever a mine is fired the mine field is weakened to that extent until the mine can be replaced, and on relative importance of the enemy element and seriousness of its threat to defense. Consequently, it may occur that an unimportant vessel should be allowed to pass, especially if it is being followed by more important vessels. Furthermore, if hostile operation can be recognized as reconnaissance preceding an attack in force, attack of a reconnoitering element will disclose location of the mine field. On the other hand, during times when surveillance by observation is impossible hostile elements traversing the mine field may be attacked by contact fire.

e. Protection of mine field.—Mines are subject to hostile sweeping, grappling, and countermining. Sweeping is the most effective operation against both controlled and contact mines. Mine sweeping operations will be conducted at night or in periods of low visibility when effectiveness of defensive gunfire is minimized. They are most likely to be successful against controlled mines at night, particularly when poor visibility renders searchlights of the defense ineffective. The principal means for protection of the mine field against mine sweeping and countermining is employment of rapid-fire

armament. Tactical employment of rapid-fire armament for this purpose is covered in paragraph 168. Tactical employment of searchlights and other illuminating agencies is covered in chapter 12.

■ 178. METHODS OF FIRE.—Methods of fire are contact, delayed contact, and observation fire.

a. *Contact fire* implies automatic firing of a mine which has become armed with no delay. It is the normal method to be employed in attacking hostile vessels since it insures explosion of the mine in direct contact with the ship.

b. *Delayed contact fire* differs from contact in that firing power is not automatically applied when a mine becomes armed, but it is applied manually with some specified delay. It therefore makes possible the decision to withhold fire under certain circumstances. Delayed contact fire offers a possibility of obtaining greater damage to the vessel attacked by delaying firing until the mine may be dragged under the ship's hull. Considering the merits of obtaining a direct hit with contact fire against the possibilities of the mine circuit being disrupted by a paravane or causing the explosion to occur at some distance from the ship in delayed contact fire, the latter method should be used with caution.

c. *Observation fire* is of limited application. Ordinarily it should be resorted to only to meet one of three tactical conditions: when it is necessary to attack one hostile vessel at a time or other hostile vessels of types not to be attacked are either in, about to enter, or have just left the mine field; when, by reason of mines damaged or previously fired, a gap exists in the mine field such that, from the predicted course of a hostile vessel, either form of contact fire would be ineffective, and a mine can be fired by observation near enough to a vessel's course to gain destructive effect.

■ 179. OBSTACLES.—The purposes of obstacles are to close harbor channel areas completely, to bar direct approach to channels, or to force adoption of formations or movements unfavorable to the attack and favorable to the defense. In addition to mines the term "obstacle" includes nets, booms, piles, and sunken ships.

a. *Nets* are provided to protect the harbor against torpedo attack from seaward and to close the inner harbor to sub-

marines. The torpedo defense net and the antisubmarine net are constructed of flexible steel wire with meshes about 1 foot square for the former and about 12 feet square for the latter. The nets are made up in sections varying in length from 250 to 1,500 yards and are supported at or a few feet below the surface by steel buoys. The net sections may be weighted at short intervals with 1,000-pound anchors or secured to mooring ships. Gates of the swinging or sinking type are provided for passage of friendly vessels. Use of nets is generally restricted to localities where no other means of defense against torpedo attack of the harbor are effective, and to water areas leading into the harbor which are deep enough to permit submarines to operate submerged.

b. *Booms* are surface obstacles made of flexible steel wire (jackstays) supported by floats and attached to shore winches. They are provided primarily to block water areas against entrance of surface craft running at high speed when other means are not available. They may have a limited application in lieu of antisubmarine nets in shallow entrances which submarines cannot enter while submerged. Booms are usually placed seaward of the antisubmarine or torpedo nets.

c. *Piles* form an effective barrier where the water is sufficiently shallow for pile driving. They may be spaced about 60 feet apart with heavy rods suspended between them and the tops about 5 feet above high water. Obstacles, called hurdles, of pyramidal steel construction which are more easily installed may be used in lieu of piles.

d. *Sunken ships* provide an effective means of closing channels which are not vital to the defense. Also, they may be employed by the attacking force to restrict or prevent use of harbor facilities.

■ 180. PROTECTION OF OBSTACLES.—Effectiveness of an obstacle is dependent on its protection and maintenance, particularly during periods of low visibility. Rapid-fire guns are provided for employment against hostile small craft operating for removal or destruction of obstacles.

CHAPTER 11

TACTICAL EMPLOYMENT OF MOBILE SEACOAST ARTILLERY

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SECTION I

GENERAL

■ 181. **PRINCIPAL MISSIONS.**—Mobility of railway and tractor-drawn seacoast artillery permits its employment—

- a. For reinforcement of fixed armament of harbor defenses.
- b. In conjunction with other arms in coastal frontier defense outside harbor defenses.

SECTION II

MOVEMENT OF TRACTOR-DRAWN ARTILLERY.

■ 182. **GENERAL.**—This section has to do with the general considerations involved in movement of tractor-drawn artillery. For further details of technique in preparation for and movement of motor transport, see FM 25-10.

■ 183. **METHOD OF MOVEMENT.**—Tractor-drawn artillery may be moved either by rail or by marching. No hard and fast rule can be made as to when units should be moved by rail and when by marching. However, movements which require a day's march or less usually can be made best by marching and movements over that distance by rail transportation if available. For length of daily marches, see paragraph 189. Because of the difference between their rates of march, it frequently will be advisable to move trucks by marching and tractors and guns by rail.

■ 184. MOVEMENTS BY MARCHING.—Movement of tractor-drawn seacoast artillery by marching requires careful planning and reconnaissance beforehand and close control during the march. The authority directing the move and assigning the route for all marches of tractor-drawn seacoast artillery should make a complete road reconnaissance before the march commences. Routes are selected as the result of a preliminary map reconnaissance. Routes selected should be then reconnoitered to determine whether or not bridges and culverts are strong enough to stand the weight of guns and tractors, and if not the amount of work that must be done to make them strong enough.

■ 185. BATTALION COMMANDER'S RECONNAISSANCE.—Reconnaissance by higher authority does not relieve subordinate commanders from making their own reconnaissance. The battalion commander's reconnaissance should cover at least 1 day's march ahead of his tractor-drawn column. He should note—

a. Nature and condition of road.

b. Points where interference with other columns may be expected.

c. Conditions and capacities of bridges and their approaches.

d. Detours.

e. Crossroads, road junctions, and other points which should be marked to indicate the route.

f. Possible parking places and bivouacs if not prescribed by higher authority.

g. Points where difficult marching may be expected such as cobblestone or concrete roads of steep grade, long stretches of narrow road, narrow roads with cuts or fills.

■ 186. FORMATION OF COLUMNS.—Tractor-drawn artillery units usually are divided into motor and tractor columns for marching in view of their different rates of march. In order to avoid undue elongation of the column over routes containing relatively steep grades, this division may also be advisable in units equipped with tractors designed for road speeds commensurate with that of the trucks since a loss of distance by the heavier matériel may be expected to occur on such grades.

The battalion constitutes the normal march serial and is organized into march units of vehicles of similar march characteristics. Formation of a larger tractor-drawn artillery unit into truck and tractor serials may be necessary if available roads and time and space factors do not permit use of normal battalion serials. A march unit normally will be composed of 25 to 50 vehicles. When practicable, it is advisable to form these march units on the basis of organizational vehicles as this will allow retention of tactical unity and facilitate supply and march discipline.

■ 187. ASSIGNMENT OF ROADS.—*a. Tractor column.*—Because of the width of the 155-mm gun carriage, it is desirable to assign the tractor column to wide roads. For tractors with steel tracks gravel roads with a good subsoil and easy grades are the most desirable and in hilly country smooth-surfaced, paved roads are especially undesirable because of the difficulty in getting traction. For tractors with rubber treads paved roads are preferable.

b. Motor columns should be assigned to paved roads or good graded roads whenever practicable.

■ 188. ORDER OF MOVEMENT.—*a.* When moving by different routes the tractor column precedes the motor column out of bivouac, the motor column remaining behind to police the bivouac area. After this work is done the motor column marches to the new bivouac area and establishes camp. When it is impracticable to have the columns march by different routes, the motor column should precede the tractor column, since it is undesirable to pass columns on the road.

b. Tactical considerations are paramount and columns must be so formed and marched as to facilitate fulfillment of tactical demands. When marching into action, regimental, battalion, and battery details, as well as advance parties from the firing batteries to prepare the gun positions, will be needed ahead early. In addition, necessary security measures must be taken for protection of the columns against air or mechanized attacks. (See FM 25-10.) The march must be so planned that all elements will be available when needed. When tactical considerations permit, the march is conducted with a view to completing the move expeditiously and with the least possible wear and tear on men and matériel.

■ 189. DAILY MARCHES.—*a. Speeds.*—Under favorable conditions the tractors with which 155-mm gun units are equipped can average $3\frac{1}{2}$ miles per hour in the daytime and 3 miles per hour at night. More rapidly moving tractors for these units have been developed and issued to some units. The motor column can average 25 miles per hour in the daytime, 20 miles per hour at night with lights, and 8 miles per hour at night without lights.

b. The length of march for 1 day should not ordinarily exceed that which can be accomplished in 8 hours' actual running time. Since in addition to the running time a total of from $2\frac{1}{2}$ to $3\frac{1}{2}$ hours must be provided for breaking camp and preparing for the march in the morning, and for inspecting and servicing vehicles and making camp in the evening, an allowance of 8 hours on the road is sufficient. It has been found by experience that the rates of march and the distances traveled will vary greatly; in hilly or mountainous country the average speed may be reduced by from 25 percent to 60 percent.

■ 190. MARCH DISTANCES.—In motor columns the leading vehicle moves at a prescribed speed which it does not exceed. The remaining vehicles keep closed up on the vehicle ahead to the limit of safety, regaining lost distance at an increased but safe speed. Greater distances are required between motor vehicles as their speed is increased. Added protection against aerial attack may be obtained by increasing the distances between vehicles (see also FM 25-10).

■ 191. MARCH ORDERS.—*a. Battalion march orders* issued by the commander of a 155-mm gun battalion which is marching independently should contain—

(1) Destination and exact route to be followed.

(2) Halt or bivouac areas in route, if any, and arrangements for necessary preparation of route.

(3) Formation of columns, including column commanders, disposition of kitchen and water trailers, repair trucks, and ambulances; and initial point and hour at which head of each column will pass same.

(4) Arrangements to permit the motor column to pass the tractor column, if necessary, and instructions to prevent interference with other columns.

(5) Location of billets, camp, or bivouac, and time by which units will close in the new area.

(6) Regulations as to use of lights on vehicles when necessary, and measures for antiaircraft and antimechanized defense.

(7) Administrative arrangements to include methods and time for gasoline supply and security measures to be taken in camp or bivouac.

b. If the battalion is marching as a part of a larger unit the battalion commander's order may be brief, much of the information being contained in orders issued by the commander of the larger unit or by the column commanders.

■ 192. CONTROL OF MARCH.—*a. General.*—Regulations governing movement of motor columns are contained in FM 25-10.

b. *Scheduled halts.*—A halt of 15 minutes' duration should be made about 45 minutes after the convoy is put in motion to permit drivers to inspect their vehicles, especially lubricating and cooling systems. Thereafter halts should be made every 2 or 3 hours, the duration depending on condition of matériel and roads and on state of the weather. During the march, personnel with tractor columns should watch the tractors constantly for any defects. Hubs of gun wheels (if not equipped with roller bearings) should be tested occasionally to see that they are not running hot.

c. *Officer conducting march.*—If the battalion commander makes the reconnaissance referred to in paragraph 185 in person, the battalion executive ordinarily conducts the march of the battalion. This procedure may also apply to battery commanders who frequently accompany the battalion commander on his reconnaissance, leaving battery executives in charge of the batteries. A normal situation would be for one battery executive (or the senior officer present with the column, if transportation of battalion headquarters battery and ammunition train is grouped with that of firing batteries) to command the motor column, the other battery executive the tractor column, with the battalion executive in charge of the march.

■ 193. RAIL MOVEMENT.—*a. Details covered by orders.*—Orders for a movement by rail of a tractor-drawn seacoast

artillery unit specify the number of trains to be furnished and their composition, entraining points, and the time of departure of each train. Railway officials will usually be furnished with this information by higher authority, but when this information has not been furnished, the commander of troops to be moved must arrange details with proper railway officials. The commander of the troops then decides remaining details of the move, such as assignment of organizations to entraining points and trains, supervision and control of movements to entraining points, and actual entraining, control during movement, detraining, and various administrative details.

b. Tactical unity.—In movements by rail, tactical unity of battalions should be preserved as far as possible. Gun batteries should not be split between two trains. Quartering parties from all units and at least part of regimental and battalion headquarters should arrive in the new area with the first units. It usually will be advisable to send a part of the service battery on one of the first trains and retain part in the old area until near the end of the movement. In make-up of trains it is desirable to keep cars of the same type together and have cars carrying heavy matériel in front of cars carrying personnel.

c. Loading.—All matériel pertaining to a tractor-drawn unit can be loaded over either a side platform or an end ramp. The side platform should be the same height as the floor of the car, sufficiently strong to carry the heaviest weights, and large enough to permit maneuvering the gun and tractor in order to approach the car from the right direction. With end loading ramps, flat cars with brake handles removed, and gaps between cars bridged over, the guns can be loaded in succession under power of the tractors. All motor vehicles can be loaded under their own power. When loaded they must be securely held in place by chocks, lashings, and transverse cleats through the wheels nailed or bolted to the floor.

d. Types of orders required.—Orders for a movement by rail ordinarily include a warning order issued as early as practicable, a more complete field order, an entraining table, and an administrative order. Because of the number of

administrative details concerning rations, baggage, evacuation, instructions to quartering parties, service trains, and other matters, an administrative order is usually advisable.

e. Loading schedules.—Commanders of batteries and similar units prepare loading schedules for their commands. These should consist of two lists; one showing matériel and personnel to be loaded on each car of the train, and the other showing for each item the car into which it will go.

SECTION III

MOVEMENT OF RAILWAY ARTILLERY

■ 194. GENERAL.—*a. Rolling stock.*—Rolling stock of railway artillery units comprises mounts for the pieces, ammunition, box, tank, fire-control, and baggage and kitchen cars, with one locomotive for each battalion. Rail transportation is thus provided within the unit itself for a large part of the matériel and some of the personnel, but when an entire unit is to be moved by rail, additional railway cars are required. Flat cars for motor transportation and passenger or freight cars will be needed for personnel and baggage which cannot be accommodated in the unit's own transportation.

b. Locomotive.—A standard type locomotive from the military railway service usually will be required as it is probable that the locomotive permanently assigned will be of a small switching type not capable of hauling the equipment of the battalion in a movement. On moves over commercial railways the organic locomotive may be moved as dead freight or under its own power. Proper railway officials should be consulted to determine method and details of such a move.

c. Method of movement.—For long moves the entire unit is moved habitually by rail. For short moves it frequently may be practicable to move only the railway equipment by rail while motor elements march and personnel not with the railway equipment move by motor transport.

■ 195. PLANS FOR MOVEMENTS.—*a. Preparation.*—In order to insure efficient employment of railway artillery in coastal frontier defense, careful consideration must be given to facilities available for conduct of rail movements and limitations imposed by the existing rail systems. Primary factors in

preparation of plans for movement of railway artillery are location of existing railway lines, gauge, limitations imposed as to clearance, and maximum axle loads that can be transported over bridges, trestles, and tracks. Since thorough study of these essentials is complex and involved, detailed plans for disposition and movement of railway artillery in coastal frontier defense operations should be prepared well in advance.

b. Operation of railway system.—The greater part of movement of railway artillery is over commercial railroads, both in time of peace and in time of war. In addition, in time of war the Corps of Engineers constructs, maintains, and operates necessary military railroads in the theater of operations. Certain trackage, usually in advance of railheads, may be placed under direct control of a railway artillery commander who will operate the system with railway artillery personnel and such attached engineer troops as may be necessary.

c. Information on trackage.—The Corps of Engineers collects and compiles data showing carrying capacity, type of roadbed and tracks, strength and clearance of bridges, and tunnel clearances for all railroads in the United States and its possessions. It also prepares loading and clearance diagrams for the various types of railway artillery. When doubt exists as to feasibility of movement of railway artillery, the entire matter may be referred to the proper railway officials. Lighter types of railway armament can be moved over practically all existing railroads in the United States. Heavier types can be moved on all the principal railroads, but on many smaller railroads and branch lines bridges and trestles are too weak to carry them.

d. Gage of tracks.—All railway artillery is normally supplied with equipment for use on standard-gage tracks. Although some electric lines are broad-gage, the majority of such lines use standard-gage tracks which can be used for moving railway artillery.

■ 196. CARE OF EQUIPMENT.—Movement of railway artillery trains differs from movement of other trains in that the cars moved are not commercial railroad property nor matériel assigned to use of military railways. Fitness of this equipment for movement is therefore a responsibility of the railway artillery commander and not of the transportation agency.

Prior to movements over commercial railways this rolling stock will be given a thorough inspection by representatives of the railway company. All commanders at all times must keep their units ready for prompt movement, and their matériel in acceptable running condition in accordance with commercial rules and military railway requirements. This involves frequent inspection of wheels, safety appliances, truck frames, archbars, bolsters, springs, hand brakes, air brakes, brake shoes, journals, king pins, and couplers.

■ 197. METHODS OF MOVEMENT.—*a. Shipment as freight.*—Railway artillery cars may be shipped as freight unaccompanied by troops over commercial or military railways. Gun cars shipped as freight will be accompanied by attendants.

b. Railway artillery trains.—Railway artillery trains may be hauled by locomotives of commercial or military railways or by locomotives assigned to the artillery unit. Engine crews and train crews are ordinarily furnished by the operating division of the commercial or military railroad over which movement is made. On tracks assigned to railway artillery all train and engine duties are performed by railway artillery troops or attached personnel.

c. Capabilities of locomotives.—In planning long movements provision should be made for 1-hour stops approximately every 150 miles for cleaning fires, making adjustments and minor repairs, and lubrication, and for the relief of engine crews about every 8 hours. A locomotive in good order at the beginning of a run should be able to haul a train appropriate to its capacity for 500 miles, and with above allowance of 1 hour every 150 miles it should perform switching service for 2 weeks before requiring heavy running repairs at an engine terminal.

■ 198. MAKE-UP OF TRAINS.—Make-up of trains varies but usually guns and ammunition cars are placed ahead, followed by vehicle and store cars, with troop cars last. For movement over first-class railroads weights of the lighter mounts (8-inch guns and 12-inch mortars) need little consideration in making up the train, but the great weights of large guns must be considered. The latter should be placed near the head of the train and should be separated by four or five cars. The overhang of some guns at one end of the mount and of the out-

riggers at the other end requires a gondola or flat car on each end of the gun car. Guns are always moved with muzzle trailing to the rear, except in the case of limited traverse weapons which must be brought into position with muzzles pointing in the direction the guns are to fire.

■ 199. MOVEMENT.—*a. Control.*—Actual movement of the train is controlled by civilian or military railway officials. The train commander is responsible for everything else in connection with the movement and is the sole intermediary between troops and railway officials.

b. Inspections.—During the movement, inspectors from the railway company, under supervision of the railway officer of the organization, at convenient halts should make inspections of running gear, paying particular attention to journals and brake shoes of gun cars. The railway officer should accompany the railway company's inspectors at all inspection points. If a car has to be set out, a guard should be left with it and arrangements made for it to be repaired and sent on as soon as possible.

c. Speeds.—The maximum safe speeds for the heaviest mounts on good tracks are approximately as follows:

On straight tracks, 30 miles per hour.

On 10° to 13° curves, 16 miles per hour.

On 13° to 18° curves, 5 miles per hour.

On 18° to 20° curves, 3 to 4 miles per hour.

On steep grades at least 12 braking cars in addition to the gun are required.

SECTION IV

TACTICAL EMPLOYMENT IN HARBOR DEFENSES

■ 200. AMOUNT AND LOCATION.—Studies to determine amount and location of reinforcing railway and tractor-drawn artillery required in harbor defenses are made during peacetime. Positions and stations are selected, orientation data prepared, and construction either completed or planned in detail. Such existing stations as are suitable and available normally will be used by mobile units, or by additional groupments or groups formed. Therefore in occupying positions in a harbor defense unit commanders should be given all necessary

information and data with orders directing occupation of positions so that it should be necessary only for them to familiarize themselves with details and issue their own orders.

■ **201. TACTICAL EMPLOYMENT.**—Within a harbor defense mobile seacoast artillery is employed tactically in accordance with fundamentals for employment of fixed seacoast artillery.

SECTION V

TACTICAL EMPLOYMENT IN COASTAL FRONTIER DEFENSE OUTSIDE HARBOR DEFENSES

■ **202. AMOUNT AND TYPE OF SEACOAST ARTILLERY NEEDED.**—

a. Mission.—The mission of mobile seacoast artillery in coastal frontier defense outside harbor defenses is to assist in defense of certain harbors or parts of the coast where no permanent fortifications have been installed. Since the probable purpose of an enemy attack will be to force a landing, mobile seacoast artillery should be so employed as to interfere to the maximum with hostile landing operations. Its principal task in this connection will be to compel transports to debark troops at a great distance from the shore and to compel supporting naval vessels to remain beyond effective supporting range.

b. Railway artillery.—Some of the supporting naval vessels will be capital ships and armored cruisers. To combat these effectively 12-inch or larger guns will be needed to fire on capital ships, and 8-inch guns to fire on cruisers. These long-range weapons will be valuable also for keeping transports at a great distance or destroying them if opportunity offers.

c. Tractor-drawn artillery.—Missions of tractor-drawn artillery outside harbor defenses include—

(1) Defense of mine fields, nets, and booms not covered by fixed rapid-fire armament.

(2) Prevention of close approach of hostile transports for debarking landing troops.

(3) Neutralization or destruction of hostile lightly armored and unarmored craft on reconnaissance missions or supporting the landing attack.

(4) Destruction of hostile landing boats, especially while beyond range of light artillery or machine guns.

(5) Enfilading beaches on which hostile forces are landing.

(6) Neutralization and destruction of hostile elements which may have landed, particularly artillery.

d. Amount of artillery.—The amount of artillery should be sufficient to cover all water areas off favorable landing beaches where hostile naval vessels and transports can operate to advantage, including those areas on flanks from which enfilade fire can be placed on beach defenses. For defense of important beaches, the artillery provided should be sufficient to place a heavy concentration of fire in off-shore water areas. As tractor-drawn and railway artillery have different missions to perform, there should be complete coverage by each type of weapon of all water areas from which the enemy can operate effectively against shore establishments.

■ 203. RECONNAISSANCE FOR POSITIONS.—Reconnaissance must always be made for selection of positions for mobile sea-coast artillery as well as for location of base-end stations, command posts, observation posts, lines of signal communication, and locations for rear echelons.

a. Preliminary.—Reconnaissance for selection of positions for railway artillery begins with a map study by higher commanders (usually sector or subsector commanders) to determine possible locations for its employment. The main features of this map study are location and capacity of existing rail lines and their relation to possible points of enemy attack. This work should be done largely in time of peace, and in any event should be completed as soon as possible after hostilities begin. Likewise, a preliminary map study supplemented by a reconnaissance made on the ground should be made for position areas for tractor-drawn artillery, detailed reconnaissance on the ground then being made to determine exact location of battery positions. Reconnaissance also may be made in time of peace or shortly after the beginning of hostilities by higher commanders or their staff officers for selection of positions for heavy railway batteries which require prepared emplacements for all-around fire. Then when a railway artillery unit is ordered into position the only reconnaissance it will have to make will be for final deter-

mination of details of occupation of positions. In other cases some latitude may be allowed subordinate commanders in selection of their positions. In any event, whenever possible artillery commanders with necessary details for constructing firing positions, preparing orientation data, and installing signal communications should precede their commands to positions.

b. Sequence.—As soon as possible after being assigned general locations and missions, artillery commanders should start reconnaissance. This reconnaissance is progressive; first, regimental or groupment commanders select, within limits imposed by higher authority, suitable areas for employment of battalions or groups; second, battalion or group commanders select general locations for batteries; finally, battery commanders determine exact positions for their guns. These various steps in reconnaissance usually will merge together. For instance, battalion or group commanders will accompany regimental or groupment commanders on reconnaissance, after which battery commanders should be close at hand to go over the ground in detail with their battalion or group commanders.

c. Elements to be located.—During reconnaissance routes are selected for occupation of positions as well as the actual positions themselves. Command posts, observation posts, locations for plotting rooms, tractors, ammunition trains, and all other elements also are selected.

■ 204. OCCUPATION OF POSITIONS.—*a. Orders.*—Orders for occupation of positions take the usual 5-paragraph form and may be written, dictated, or oral. (See chapter 17.)

b. Preparing positions.—Preliminary reconnaissance having determined battery positions, the work of preparing positions is undertaken. In addition to battery details, certain members of each gun section equipped with necessary tools and material should precede firing batteries to selected positions. While regimental, battalion, and battery details are preparing necessary topographical data, establishing observation posts, command posts, and plotting rooms, and installing signal communication, advance detachments from firing batteries prepare battery positions. In this manner it is possible to emplace firing batteries very quickly when they arrive.

■ 205. TACTICAL EMPLOYMENT.—*a. Tactical employment* of mobile seacoast artillery outside harbor defenses is generally the same as in harbor defenses. Forms of naval attack against a coast line will resemble those against a harbor defense, and action to be taken by seacoast artillery in coastal frontier defense will be governed by the same fundamental factors. In each situation decision to fire or to withhold fire, what battery to employ, what targets to fire at, and what method of fire to use will be based on conditions existing at the time.

b. Against naval reconnaissance, fire may be withheld altogether in order to avoid disclosing battery positions, or some fire may be placed on reconnoitering vessels to force them to remain at such a distance that they cannot observe important elements ashore.

c. Transports, being unarmored, are vulnerable to fire of 155-mm gun batteries. However, they are of such importance that they are considered proper targets for all calibers of guns, including primary armament, and whenever it is possible to fire on them with reasonable probability of hitting, they should be brought under such concentration of fire as will insure their destruction. If transports approach covered by a smoke screen laid by destroyers, the destroyers should be taken under fire by 155-mm guns, or if beyond 155-mm gun range, then by 8-inch guns.

d. Vessels providing artillery support for hostile landing forces, such as battleships, cruisers, and other vessels, must be neutralized by fire of seacoast artillery batteries. For this purpose, shore batteries should distribute their fire so as to place some fire on all such supporting vessels rather than concentrating fire on a limited number.

■ 206. SEARCHLIGHTS.—*a. No searchlights* are assigned organically to either railway or tractor-drawn regiments. However, for coastal frontier defense operations one searchlight battery should be attached to each regiment. It is obvious that mobile seacoast artillery units employed outside harbor defenses must have searchlights in order to accomplish their mission, otherwise they would be helpless against landing attacks made at night.

b. Tactical employment of searchlights is covered in chapter 12.

■ 207. EMPLOYMENT IN HARBOR DEFENSE.—In addition to being used to reinforce harbor defense artillery in existing harbor defenses, mobile seacoast artillery may be assigned the mission of defending minor harbors where no harbor defense now exists. Location and employment of such artillery would conform to the fundamental factors which govern defense of more important harbors.

CHAPTER 12

TACTICAL EMPLOYMENT OF SEARCHLIGHTS AND OTHER MEANS OF ILLUMINATION

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SECTION I

GENERAL

■ 208. MEANS OF ILLUMINATION.—Three means of securing illumination of water areas and targets at night are searchlights, star shells, or airplane flares. Successful defense against naval attack or raid at night will depend largely upon the efficiency and correct tactical use of searchlights. Star shells (not standard) and airplane flares are supplementary to searchlights and extend the range of effective illumination beyond the limited range of the searchlights.

■ 209. COMMUNICATION.—For a discussion of communication, see chapter 13.

SECTION II

MISSIONS, TYPES, AND FUNCTIONS

■ 210. MISSION.—The primary mission of searchlights is illumination of hostile naval targets during periods of darkness. In addition to their primary mission they may be employed to search water areas, to search or illuminate beaches, to serve as barrier lights, and to serve as a means of signal communication. However, their employment for purposes other than illumination of targets should be reduced to a minimum.

■ 211. TYPES.—Searchlights are classified according to type as fixed and mobile.

a. Fixed searchlights include those mounted in fixed positions or capable of but limited movement for purposes of protection or concealment.

b. Mobile searchlights include types which are transported on special motor trucks with power units either integral with the truck or transported or towed by a separate vehicle, and a type designated *portable* for which no special motor vehicle is provided.

■ 212. FUNCTIONS.—Searchlights are classified according to functions as barrier, searching, and illuminating. Functions of searchlights are not rigid. Any light may on occasion perform functions other than those pertaining to its normal assignment.

a. Barrier lights are those used in certain exceptional cases to detect passage of vessels toward or through a channel or harbor entrance.

b. Searching lights are those used to search a water area for the purpose of detecting presence of vessels therein.

c. Illuminating lights are those used to illuminate a target in order that it may be tracked and fired upon.

SECTION III

EMPLACEMENT OF SEARCHLIGHTS

■ 213. DETERMINATION OF NUMBER.—*a.* Determination of exact number and location of searchlights required for any particular locality is a local problem which can be solved most satisfactorily by actual tests with mobile lights. It will depend on local hydrography and topography, particularly on configuration of the shore line as related to character, extent, and location of the armament; on number and grouping of horizontal base lines; on location of base-end stations with relation to other elements of the defense and to channels of approach, and on general atmospheric conditions in the area. In general the number of lights should be sufficient to provide two lights at each end of each separate group of horizontal base lines for use primarily as illuminating lights for the armament served by that group of base lines, and a suffi-

cient number of additional lights as determined by local conditions to provide for searching and barrier missions.

b. Installation in pairs.—In general in each important position a pair of lights instead of a single light should be installed. Where the interval between adjacent ends of two adjacent groups of base lines is relatively small, a total of two (or three, depending upon requirements for searching lights) lights instead of four lights (one pair for each group of base lines) will often be sufficient for the interval, since with a proper communication system any of these lights should be able to serve either of the two groups of base lines.

■ 214. HEIGHTS OF SITE.—*a. Minimum elevation.*—A searchlight in its operating position should be not less than 40 feet above the water in order that usefulness of the light may not be limited by effect of curvature of the earth. A minimum height of 60 feet is desirable to facilitate observation.

b. Maximum elevation.—(1) The disadvantage of too great a height of site is the unilluminated or dead space between the end of the beam and the shore within which presence of a vessel may not be detected when the light is being used at its outer ranges. Lights normally used for barrier or searching lights should not be sited at heights greater than about 100 feet in order that the diffused light from the beam may serve to eliminate any dead space in illumination of the water throughout entire length of the beam.

(2) Lights normally used for illuminating lights may be sited at heights as great as 300 or 400 feet. Siting illuminating lights at different heights within permissible limits facilitates searchlight maneuvering by increasing the number of lights that may be used to cover an area without mutual interference.

■ 215. NECESSITY FOR ADVANCED LOCATIONS.—*a. Barrier lights* when required normally will be located on flanks of entrances they are designed to protect. This may result in their location in positions exposed to attack. It may be practicable in some cases to locate a barrier light so as to enfilade a narrow channel or water approach.

b. Searching and illuminating lights should insofar as practicable be located to cover every part of assigned areas, including water areas suitable for use of small boats used in landing

attacks although not navigable for larger vessels, and including suitable landing places. Range of seacoast artillery greatly exceeds searchlight range. This precludes practicability of covering with searchlights the entire zone of its effective fire. It also demands that full advantage be taken of advanced positions for lights, whenever available, to the front or toward a line of approach on a flank of the guns. In general, on account of dead space created in front of the guns, lights should not be installed in rear of the guns they serve unless the lights are at a considerably higher elevation than the guns.

■ 216. LOCATION WITH REFERENCE TO OTHER ELEMENTS.—*a. Difficulty of observing through beam.*—A target though well illuminated cannot be seen through the length of a searchlight beam and cannot be seen very clearly through the width of the beam. The ideal arrangement therefore is to have the controller operator illuminate the target with the side of the beam on which he and all observers and gun pointers are stationed. It follows that if possible an illuminating light should be on a flank of all elements it serves.

b. Flank locations; difference in elevation.—Based on the same fundamentals given in *a* above, the greater the difference between elevation of the light and the observers, the better the observation of the target. Experience has shown that, where practicable, the light should not be less than 150 yards from the flank of the nearest fire-control station or battery in order that diffused light from the beam may not interfere with observation; and that the difference in elevation of the light and of any observer who is to observe in its beam should be not less than 20 feet. Where practicable, an illuminating light should be sited higher than the elements it serves, since, with this relative position, when the beam is held so that only its lower elements rest upon the target, it interferes least with observation. This consideration should not however be permitted to govern to the extent of requiring the light to be installed on a conspicuous structure or to be unduly withdrawn to the rear.

c. Illumination of foreground.—Location of the light should be such that illumination of the foreground does not indicate

other elements of the defense and that fire directed at the light or at the other elements will not endanger both.

d. Illumination of mine field.—Location of lights should provide for effective illumination of the mine field and of water areas containing nets, booms, and other underwater barriers subject to enemy attack.

■ 217. INSTALLATION OF LIGHTS IN PAIRS.—*a. Mutual support.*—Lights normally should be installed in pairs so that in case one light is put out of action for any reason, whether by enemy action or for purposes of recarboning or readjusting, the other light will be readily available for use. While two lights should be located with a view to being capable of mutually acting one for the other, they must be sufficiently separated to insure that both may not be destroyed by a single shot or bomb. As a rule lights installed in such a manner cover a greater water area than a single light and tend to reduce dead space.

b. Economy of installation and operation.—Installation of lights in pairs furthermore serves to reduce cost of installation, since a single structure can house generating sets for both lights, and similarly it reduces personnel overhead required for operation of these sets.

■ 218. PROTECTION.—The most effective protection against enemy gunfire or air attack is afforded by concealment of lights when not in action and by concealment of power plants. The most satisfactory cover and concealment for fixed lights are secured by—

a. Mounting searchlights on a tower that can be lowered vertically into a prepared well when not in use, this well being so constructed that when covered its position cannot be located readily by visual or photographic means.

b. Mounting light on a car which can be run into prepared cover when not in use.

c. Mounting light on a bascule mount or swinging tower that can be lowered under trees or other cover affording concealment from observation from the water and from the air.

d. Withdrawing mobile lights during the day from operating positions to other positions affording better concealment, and by frequent changes of operating position.

e. Locating power plants of fixed lights in well concealed bombproof structures, and mobile plants in woods or other positions where concealment and cover may be secured both against aerial and terrestrial observation.

■ 219. BEACH ILLUMINATION.—*a. Secondary missions of searchlights.*—While effective illumination of naval targets is the primary consideration in location of searchlights, adequate provision must be made where necessary for support of beach defense by providing for searching and illuminating landing places. In determining location of lights in any defended area, either within or without a harbor defense, thought should be given to illumination of these landing places.

b. Locations.—In many cases this is practicable if the light is located on a projecting point of land from which the shore on either flank can be illuminated. In some instances advantage can be taken of small islands near the shore from positions on which a searchlight can illuminate both water to the front and shore line to rear and flanks.

■ 220. LOCATION WITH REFERENCE TO CONTROLLER AND SEARCHLIGHT.—Ordinarily each fixed light is operated from a control station by means of a distant electric controller. The controller is located in such fire-control station as affords an excellent view of the water area normally to be covered by the searchlight. In location of the light, position of the control station is important because of desirability of minimizing length of both telephone line and controller cable. It is also desirable that the light be not more than a few hundred yards from the controller and on its flank, as otherwise it may be difficult in case many lights are in action for the controller operator to recognize his own beam.

■ 221. MOBILE SEARCHLIGHTS.—Mobile searchlights are employed outside harbor defenses with tractor-drawn and railway artillery, and to supplement fixed lights within the harbor defenses. Where suitable roads are available their mobility is an advantage in that alternate positions may be readily prepared and occupied, and isolated or distant stations used where fixed lights would be difficult to maintain. When plans contemplate their employment in a harbor de-

fense, positions and communication lines should be prepared and maintained at all times.

SECTION IV

SEARCHLIGHT DIRECTION AND CONTROL

■ 222. GENERAL.—*a. Searchlight direction* includes determination as to when each light will be put in action, who will control it, and general nature of employment, including decision as to whether it is to be used as a barrier, searching, or illuminating light, and the particular water area or ship formation to be covered.

b. Searchlight control includes issue of necessary instructions to operators of the light to put it into or out of action and assignment of a mission which in the case of illuminating lights includes assignment of the target. Searchlight control is exercised by the officer who communicates directly with the controller operator or with the operator of the light in case the controller is not used.

■ 223. PHASES INVOLVED.—Two phases are involved in direction and control of searchlights used by seacoast artillery. The first phase extends to the time targets are definitely located and assigned to groupments or groups and involves use of barrier and searching lights only; the second phase introduces use of illuminating lights. Control of such lights as may be used to support beach defenses during the second phase will be exercised by the senior tactical commander directly charged with support of beach defense, or by such subordinates as he may designate. The following applies in direction and control of searchlights:

a. In general, direction of all searchlights that cover a given area must be centralized in the senior tactical commander who can observe the area. This is necessary to insure that the number of lights in use shall be maintained at the minimum consistent with the tactical situation, and to obviate interference between lights in action.

b. During the first phase the officer or officers exercising searchlight direction will also exercise searchlight control of such lights as may be put into action. Exercise of such control which will involve special signal communication will be facilitated by a carefully prepared plan of illumination.

c. During the second phase, direction and control of such barrier lights and searching lights as may be maintained in action for intelligence purposes normally will continue to be exercised by the officer who exercised these functions during the first phase. This officer may relinquish control of an illuminating light or lights to a subordinate commander when the—

(1) Subordinate commander is in better position to observe the water area concerned.

(2) Subordinate commander is directing all or major part of the action.

(3) Engagement for any reason assumes such a character that centralized control is impracticable.

■ 224. CONTROL.—*a.* To facilitate searchlight control the navigable water area is divided into subareas, each designated by a suitable name, which may be the same as the subareas into which the battle area is divided.

b. Looking seaward, fixed searchlights of a harbor defense are designated consecutively from right to left by numerals. Sites selected for occupation by mobile searchlights are designated consecutively from right to left by prime numerals. A mobile searchlight, when occupying a given site, is designated by the number of that site.

c. Commanders exercise their functions of searchlight control through searchlight officers who utilize a jack set or cordless switchboard over which direct telephone communication may be had with each searchlight and each controller operator.

■ 225. CONTROLLER OPERATOR.—The controller operator is addressed as — Controller, thus, TWO CONTROLLER. In addition to executing commands of the searchlight officer, he is responsible that the—

a. Target assigned to his light is properly illuminated and that in searching the beam is combed for targets. He should be provided with an observing instrument to enable him to follow his target effectively and to discover targets in his beam.

b. Azimuth scales of controller box and searchlight always read the same. The controller operator will cause the search-

light operator to mesh the light with the controller mechanism at an azimuth designated by him at the command **PREPARE FOR ACTION**, and will check the azimuth at appropriate intervals thereafter.

c. Approximate azimuth desired should always be reached before the light goes into action. When the light is ordered into action and given a mission, the controller operator will first traverse it *dark* or, if using hand control, cause the searchlight operator to traverse the light *dark* to the approximate azimuth of the target to be covered or area to be searched.

d. Searchlight officer is informed when the carbon of his light is down to about 5 inches and when in following a target his light gets within 10° of its limit of traverse.

e. Hand control is started without command from the searchlight officer and without delay in case electrical control goes out of order while the light is in action. The controller operator will give necessary commands for hand control to the searchlight operator to continue to search or follow by hand, and then notify the searchlight officer that electrical control is out of order and that he is maneuvering the light by hand.

■ 226. **SEARCHLIGHT TELEPHONE OPERATOR.**—The searchlight telephone operator is stationed at the light. He receives commands of the controller operator and the searchlight officer. To insure closer coordination the searchlight telephone operator, keeping his head set on, will operate the traversing hand-wheel when hand control has been ordered.

■ 227. **COMMANDS.**—Commands and their meanings employed in operation and control of searchlights are as follows:

a. *Prepare for action.*—The light will be put in its operating position, the power plant started, the light and telephone tested, and the personnel will take their posts.

b. *In action.*—The designated searchlight will be put in operation. Thus **EIGHT, IN ACTION** signifies that the searchlight occupying searchlight position 8 is to be put in operation.

c. *Out.*—The designated searchlight immediately will be put out thus placing the light in the same condition as **STAND BY**. Thus **TWO, OUT** signifies that fixed searchlight No. 2 is to be put out of operation, but the power plant is to be kept

running and if the position of the target is known, the light will be kept trained upon it.

d. Rest.—The designated light if in action will be put out and the power plant shut down. Personnel except telephone operators will fall out, but will remain in the vicinity.

e. Stand by.—The designated light will be kept ready to go into action immediately, and if position of the target is known the light will be kept trained upon it.

f. Hand control.—The designated searchlight will be operated by means of the hand controller. ELECTRICAL CONTROL means that the designated searchlight will be controlled by means of the electrical controller.

g. Azimuth.—The designated searchlight will be set at the designated azimuth, thus TWO, AZIMUTH FOUR ZERO.

h. Search.—The designated searchlight will be used to search its entire area, thus TWO, SEARCH. If it is desired to search a certain subarea the command is —, SEARCH —, thus TWO, SEARCH LYNNHAVEN.

i. Search right (left).—The particular function upon which the designated light may be engaged will be discontinued and it will be used to search right (left) until ordered to halt.

j. Follow.—The beam of the designated searchlight will be kept on the target even if the latter passes out of the area which the light has been ordered to search, thus TWO, FOLLOW.

k. Cover.—The searchlight designated first will be used to cover the target being illuminated by another searchlight, thus EIGHT, COVER TWO.

l. Focus, spread, contract, right, left, raise, lower, stop.—These are the commands used to accomplish the objects indicated by them.

m. Slower, slow, fast, faster.—The rate of searching may be regulated by these commands.

n. Elevate.—At this command the beam is raised 30° and held there until further orders.

o. Two controller, two light.—When it is necessary to distinguish between the telephone operator on the controller telephone and the one on the light telephone, the commands TWO CONTROLLER or TWO LIGHT will be used.

■ 228. SEQUENCE AND REPETITION OF COMMANDS.—*a.* When the searchlight officer calls a controller operator and gives a command, the controller operator will—

- (1) Answer to his designation.
- (2) Repeat the command.
- (3) Receive the "OK" from the searchlight officer.
- (4) Call his light and execute the command.

He will not execute the command or call his light before he has repeated the command to the searchlight officer and received "OK."

b. Operation at light.—As the men at the light can see little in its beam, commands such as SEARCH, COVER, and FOLLOW are not sent to the light. If the operation is by hand, all the searchlight operator needs to know is in what direction to traverse his light, how slowly, and when to stop. The controller operator therefore does not transmit commands from the searchlight officer *verbatim* to the light, but translates them into proper commands for the light.

■ 229. TECHNIQUE OF OPERATION.—*a. Hand operations.*—If normal electrical control goes out of order or gives a traverse too uneven for searching or illuminating, hand operation will be used. It is practicable to bring hand operation to a point where the controller can move his light by voice nearly as effectively as by his controller mechanism. Hand operation may be made especially effective when used against slowly moving targets at outer ranges. Hand operation is mainly a matter of teamwork between the controller operator and searchlight operator. Common sense and close cooperation between the two men are the requirements. The searchlight telephone operator takes post at the traversing handwheel and operates it. He concentrates on attaining the exact rate of traverse desired by the controller. The controller operator determines the approximate azimuth, orders it set by hand, and follows this with the command IN ACTION, thus, from controller to light, TWO LIGHT, APPROXIMATE AZIMUTH 50, IN ACTION. The controller operator also coaches the searchlight operator constantly, giving the necessary commands to keep the beam in the position desired.

b. Interference.—A searchlight which is put in action before it is approximately at the azimuth where it is to be used may interfere with other beams or disclose a friendly patrol vessel. Therefore it is invariably traversed dark to the desired approximate azimuth. This procedure has the further advantage of saving time, as the controller operator starts traversing his light while receiving the command and sends his commands to the light while traversing with a timing calculated to bring the light to the desired azimuth and into action simultaneously.

SECTION V

TACTICAL EMPLOYMENT

■ 230. GENERAL.—*a. Use of other reconnaissance agencies.*—While it is very important that capabilities and probable lines of action of the enemy be analyzed before attack begins, it is equally important that the enemy be kept in ignorance of defensive dispositions. Naval patrols may be depended upon to report presence of enemy vessels. However, the command must build up a reconnaissance organization, utilizing such means as patrol boats, subaqueous sound ranging, radio direction finding, and distant illumination by airplane flares when available,

b. General use of searchlights.—As searchlights have a limited range, their use as a means of discovering presence of the enemy near the limits of their range may do more harm than good. They can be seen for great distances, marking limits of defenses and serving as aiming points and aids to navigation for the enemy. Their use should be limited to situations where the enemy, already discovered, is so close that searchlights no longer aid him but on the contrary blind him and also illuminate enemy ships sufficiently to permit shore batteries to open fire. Movements of enemy vessels having been followed by the means already mentioned above the guns, observing instruments, and lights should be kept laid as closely as possible on their targets in order that when the time to open fire arrives lights may be put in action and rapid and concentrated fire opened from all available armament with the least possible delay. No light should be put

into action until its use is required for accomplishment of a specific mission. The minimum number of lights necessary for accomplishment of the mission should be employed.

c. Use of searchlights on approach of enemy vessels.—On approach of enemy vessels the commander exercising searchlight direction may put into action a minimum number of lights, preferably those most distant from important elements of the command, with a view to picking up or illuminating targets until a decision is made as to assignment of targets to tactical units.

d. Use of searchlights as reconnaissance agencies.—In those cases where searchlights are the only reconnaissance agencies available, they should be employed for this purpose to the minimum extent consistent with gaining the necessary information, and in any case searchlights performing reconnaissance missions normally should be operated intermittently.

■ 231. **EFFECTIVE RANGE.**—*a.* Effectiveness of a searchlight beam is dependent upon atmospheric conditions, fog, mist, rain, snow, or smoke reducing effectiveness in proportion to their respective densities. Searchlights are most effective when the air is free from moisture and smoke, and on dark nights when the moon and stars are not visible. Effectiveness of observation further depends upon size, color, and course of the target, upon the position of the observer with respect to the target and to the light, upon the background, and upon the skill of the observer and of the searchlight control operator.

b. Normal effective range of a searchlight under favorable conditions does not greatly exceed 8,000 yards. The range is greater in localities having unusually favorable atmospheric conditions and for lights sited at heights of 150 feet or greater. Further, searchlight range may be materially increased by using two lights to illuminate a target because of the advantage of increased light intensity and two planes of illumination.

■ 232. **BARRIER LIGHTS.**—While targets are more easily picked up when passing through a fixed beam than when passing through a moving beam, use of barrier lights is rarely justified

because of valuable information that the fixed beam gives to the enemy both as to location of defense elements and range to the shore line. In addition to giving information to the enemy, fixed beams have the disadvantage of making an approach to the shore from a direction outside the beam more difficult to detect.

■ 233. **SEARCHING LIGHTS.**—*a.* A searching light is used to search through a definite and well-defined sector, the limits of which have been determined and prescribed. As these sectors may correspond to subdivisions of the water area as used for purposes of target assignment and identification, their limits may be determined by well-defined features such as islands or where this is impracticable by limiting azimuths from each light.

b. Width of sector.—(1) In use of a searching light it is important that consideration be given to width of the assigned sector, angular speed of the beam while searching the sector, and procedure employed in searching the sector.

(2) An appreciable time is required for the eye to receive an impression and considerably more time is required to confirm the impression. A beam may be traversed at what appears to the observer to be a slow angular speed, yet the linear velocity of the end of the beam may be so great that the observer will not detect the target.

(3) A searching light should not be assigned to a sector of more than 60°. For traversing a sector of this size approximately 6 minutes will be required. Assuming the beam to be traversed continuously across the sector and back again, approximately 12 minutes will elapse between successive illuminations of areas near either flank of the sector so that a vessel moving at 30 knots could, by selecting the proper instant, come in through the entire zone of effective illumination without being illuminated by the light.

c. Fundamentals covering employment.—It follows that in the case of searching lights—

(1) The number of lights should be large enough so that, in searching, the sector to be covered by each light shall be as small as practicable and preferably less than 60°.

(2) The angular speed of traversing the beam should not exceed about 10° traverse per minute of time.

(3) The procedure used in traversing the light should be such as to render it difficult for an enemy to predict probable movements of the beam. As a rule the light should not be traversed continuously across the sector in the same direction, and no simple system easily understood by the enemy should be employed.

(4) A searching light should not be put into action until such time as reasonable assurance exists of probable presence of the enemy within approximate range of searchlight illumination.

(5) A searching light may at any time be used for an illuminating light when a target has been detected.

■ 234. ILLUMINATING LIGHTS.—Limitations upon the number of targets that can effectively be illuminated simultaneously may result in the necessity for use at night of concentrated fire on targets that can be given proper and simultaneous illumination. Where it is practicable for two vessels in a given formation to be illuminated, the two flank vessels, or the leading and the rear vessels, depending upon the formation, should be illuminated to simplify identification of targets by distant observers.

■ 235. BLINDING EFFECT.—*a.* A searchlight beam directed upon an enemy vessel will interfere seriously both with those directing movement of the vessel and with fire direction of the vessel armament. This has special application when an enemy attempts a run-by at night.

b. The difficulty of seeing through a searchlight beam has been mentioned. By a skillful use of harbor defense searchlights, our own vessels leaving a harbor by night may be protected against enemy observation. Similarly, if information is received of approach of enemy destroyers or submarines at night for an attack upon vessels at anchor, their observation can be seriously obstructed by crossing searchlight beams in advance of the anchorage.

SECTION VI

ILLUMINATION

■ 236. AIRPLANE FLARES.—*a.* Illumination by means of airplane flares affords the most practical means of extending

the range of effective night firing beyond the limited range of shore searchlights. This method has the advantage of not indicating to the enemy location of defense elements but is difficult of accomplishment.

b. The most effective illumination is obtained by placing the flare within 2° of the observer-target line, about 2,000 yards beyond the target, and approximately 600 yards above the water. For horizontal-base tracking, a flare is required for the observer-target line of each observer. This requirement will normally restrict employment of airplane flares to distant searching missions.

■ 237. ILLUMINATING SHELLS.—Illuminating (star) shells have been employed with 6-inch and 155-mm guns in experimental firings. The tests indicate that this type of ammunition is used most advantageously for searching areas beyond the effective range of searchlights. Prior to conducting searching fire, the target should be located approximately by supplementary means when available in order to conserve ammunition. Four or more guns are employed initially, adjacent pieces being fired with azimuths differing by about 3° . Illumination is most effective when the burst occurs on the observer-target line and about 1,500 yards beyond the target. Searching fire normally should be opened at maximum range with fuses set at full time. After discovery of the target illumination may be maintained with fewer guns. Range and fuse corrections are determined and applied after the target has been illuminated and the necessary observations have been made. All observing stations available and not otherwise engaged are employed during the searching phase. In view of the necessity for silhouetting the target by providing illumination on or near each observer-target line, employment of illuminating shells has limited application for tracking with horizontal base. Such employment is difficult to control and may interfere with observation from stations being employed in conduct of fire against other targets.

■ 238. PLAN.—a. The purpose of an illumination plan is to facilitate and expedite direction of searchlights and other illumination agencies. For harbor defenses and areas outside harbor defenses where use of illuminating agencies can be foreseen, peacetime studies of the most advantageous

means of utilizing the various illumination agencies should be made. Actual tests should be made with searchlights and also if practicable with airplane flares. Results of these studies and tests should be incorporated in a carefully prepared illumination plan as a part of the defense plan of the harbor defenses or other area. This illumination plan may, upon opening of hostilities, be issued as an annex to the field order directing occupation of battle positions. Groupments may on occasion have illumination plans.

b. Scope and character.—An illumination plan should be general in scope and simple in character. It may include—

(1) Location of each fixed light and location of normal and alternate positions for mobile lights.

(2) Designation of searching lights, normal sector to be covered by each light, method and rate of traversing, assignment of fire-control stations to observe in the beam of each light, and designation of the commander responsible for direction of the lights.

(3) Designation and method of employment of barrier lights and designation of the commander responsible for direction of the lights.

(4) General instructions for employment of illuminating lights, including designation of the commander responsible for their direction.

(5) Restrictions on use of searchlights.

(6) Announcement of the Air Corps unit which may be called upon to drop flares, method of communication therewith, and designation of the commander responsible for direction of this form of illumination.

CHAPTER 13

SIGNAL COMMUNICATION

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SECTION I

GENERAL

■ 239. GENERAL.—*a.* Signal communication comprises all methods and means employed to transmit commands, messages, position-finding data, firing data, and signals.

b. The telephone system employed in seacoast artillery is called the fire-control telephone system and includes all circuits used for tactical purposes as well as those used solely for fire control. It is the channel within an artillery unit through which the unit commander transmits orders and information pertaining to conduct of fire or fire direction, and through which technical information and data affecting fire of the unit are sent between subdivisions of the unit. From the nature of its installation, the fire-control telephone system allows immediate personal communication between any commander and his subordinate commanders, and between certain individuals within a unit engaged in technical control of fire.

■ 240. RESPONSIBILITY OF COMMANDERS.—*a.* The commander of a seacoast artillery unit is responsible for establishment of signal communication within the unit. In fixed harbor defenses practically all necessary communication will be installed during peacetime.

b. In a harbor defense, the communication officer of a harbor defense regiment assigned to the harbor defense is

normally detailed as harbor defense artillery engineer and communication officer, and is charged with maintenance and operation of all signal communication agencies of the harbor defense. He performs all the duties allotted to the unit communication officer in FM 101-5 except installation of fixed fire-control telephone systems, which is the responsibility of the Signal Corps.

c. In mobile seacoast artillery units, the communication officer performs all the duties of the unit communication officer as given in FM 101-5.

■ 241. MEANS OF COMMUNICATION.—Means of communication employed by seacoast artillery may include—

Wire telephone.

Radio, telegraph, and telephone.

Electrical and mechanical transmitting devices.

Voice tubes.

Visual means (panels, flag hoists, signal lamps, pyrotechnics).

Messengers.

Wire telegraph and teletype.

These agencies should be organized and coordinated to provide an efficient system of signal communication which will meet tactical requirements, provide safety and reliability under service conditions, provide simplicity in operation, maintenance, and testing, and provide flexibility to insure availability of alternative means of communication between all vital elements of the command during combat.

a. The *wire telephone* system is the most important means of communication provided. Its greatest advantage lies in the fact that it provides immediate personal communication between individuals.

b. *Radio*, the most important auxiliary to the wire telephone, is the primary means of communication between ship and shore and between air and ground. In other cases it is a secondary but important means of communication. Its greatest disadvantage is lack of secrecy when used without code, and when code is used it is a very slow means of communication. It is also subject to interference.

c. *Electrical and mechanical transmitting devices* are often used to transmit firing data from plotting rooms to emplace-

ments, to transmit firing signals in mortar and certain other major caliber batteries, for distant electrical control of searchlights, and for indicating time simultaneously at various stations.

d. Voice tubes are installed sometimes as emergency means of communication between adjacent elements of fixed batteries.

e. Visual signaling is employed as an auxiliary or emergency means of transmitting messages over relatively short distances. Panels are used to transmit short messages by the air-ground code from the ground to airplanes when radio is not available. Flag holsts are used to communicate with ships by the international code. Signal lamps may be used for similar purposes. Pyrotechnics are used from the air, from the ground and from vessels for the purpose of transmitting brief prearranged messages which require immediate action. In time of peace they are not employed along the seacoast since they may be mistaken for distress signals.

f. Messengers are used for transmission of lengthy messages and routine and intelligence reports. All messages which do not require immediate action or personal communication should be sent by messenger to avoid overloading wire and radio systems. Whenever scheduled messenger service is required, the service is operated by the superior unit to serve its subordinate units.

g. The wire telegraph and teletype are sometimes used, particularly between harbor defense and higher headquarters, and may be used within a harbor defense for administrative and supply purposes.

SECTION II

SIGNAL COMMUNICATION FOR FIXED SEACOAST ARTILLERY

■ 242. GENERAL.—In each harbor defense two complete telephone systems are installed, the *post telephone system* for administrative purposes and the *fire-control telephone system* for tactical use. The two systems are independent and employ separate switchboards and power supply sources, but are interconnected, usually at the switchboards, so that in emer-

gency facilities of the post system may be utilized where applicable in the tactical chain of command. Because of the permanent character of the installations they are installed in time of peace. The fire-control telephone system assures reliable communication for tactical purposes. It is designed to provide sufficient flexibility to permit such changing or switching of circuits as may be required. The aim is to provide in the permanent fire-control telephone system complete and reliable telephone communication for fixed elements, and also insofar as practicable for mobile armament designated in the harbor defense project as included in the harbor defenses. Flexibility is obtained by means of the standard fire-control switchboard (BD-74), and by use of switching devices such as cordless switchboards or switching panels installed in command and other stations for local routine switching.

■ 243. REQUIREMENTS OF FIRE-CONTROL TELEPHONE SYSTEM.—

a. This system should meet tactical requirements. It should preserve the tactical chain of command under service conditions and should facilitate rapid transmission of orders, data, and intelligence.

b. The system should provide safety and reliability. A permanently installed common battery system is used. The switchboard room is the heart of such a system, and damage to the switchboard or source of power may render the entire system inoperative. Therefore the switchboard room should be bombproofed and camouflaged and provided with defense against hostile raiding parties and sabotage. Means should be provided for quickly and easily testing, cutting out, or replacing any unserviceable element.

c. Fire-control telephone cables are paper-insulated, lead-sheathed cables of commercial manufacture, laid under ground or under water. Fire-control cables should follow concealed and protected routes where practicable, but routing should be such as to facilitate maintenance and protection by guards. Submarine cables should, where practicable, be laid in deep water to provide concealment from air observation and protection from sabotage. They should be concealed at the points they enter and leave the water. When necessary to lay them in shallow water, they should, if practicable, be entrenched for concealment from the air. Cables should

contain sufficient numbers of pairs to care for requirements of all elements in the harbor defense project for which permanent communications are contemplated and, in addition, a reasonable excess to provide for emergency, such as failure of pairs in use. In routing either land or submarine communication lines, consideration should be given to the desirability of minimizing the effect upon the system as a whole of permanent or temporary disablement of any important element of the system. For land communication cables particularly it is also desirable, where practicable, that they be routed in such a manner as to minimize likelihood at any time of their coming in contact with high voltage power lines.

d. The system should provide flexibility for making special, emergency, and routine connections. Special and emergency switching is provided in the switchboard. Routine switching (for example, changes of base line for batteries having several observing stations) is decentralized (under control of the battery commander) by use of small switchboards or switching panels or other suitable devices. Whenever special devices are provided for routine switching other than at the fire-control switchboard, connections should be made so that this switching, if required, can also be done in the switchboard room. One pair in each cable should be connected through to the central switchboard for test purposes. This pair should be marked plainly so that it will not be used as an operating circuit.

■ 244. GROUPMENT AND GROUP COMMUNICATIONS (see fig. 7).—

a. Old standard installations provided separate telephone lines connecting a groupment or group command post with each command post in the next lower echelon. In recent installations means are provided for paralleling these lines and making them available for use of the commanders in person. Such a system of parallel telephone lines connecting each commander with his subordinate commanders in the next lower echelon is called an *order net*. By means of a switching device each commander will be able to connect his telephone to any or all of the command lines to transmit personally important orders directly to subordinate commanders. Use of the order net minimizes the number of telephone operators required and permits all commanders in the

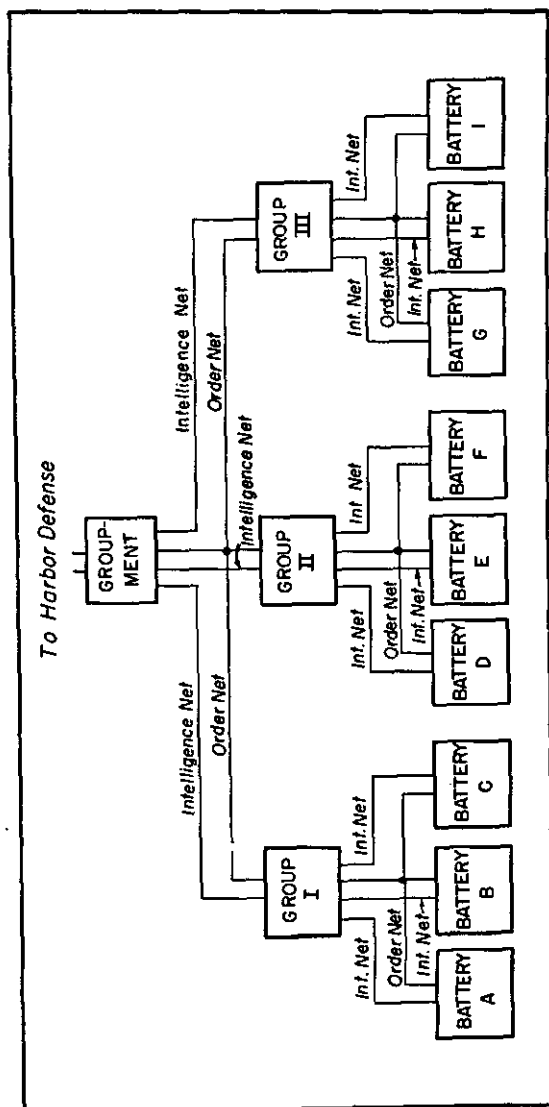


FIGURE 7—Groupment and group communications.

NOTE.—When equipment is available each order net should be connected by means of a switching device.

net to be informed as to all orders issued to other commanders in the net. It preserves the tactical chain of command since at any time the then senior officer in the net can take command conveniently in the groupment or group. Similarly, it should be practicable for the command line from the next superior unit which is normally manned by an operator to be connected by means of a switching device direct to the commander's telephone so that he can personally receive important messages or orders.

b. An intelligence line is also provided between a groupment or group and each of its subordinate units over which routine messages and intelligence reports are transmitted. These also serve as emergency command lines in case of failure or damage to the regular command lines. It should be practicable to parallel these lines by means of a switching device to form an intelligence net if desired.

c. The switching device provided for each order or intelligence net should be arranged to enable the commander to communicate with—

(1) Any of the subordinate stations separately, leaving the other lines connected together in the net.

(2) Any desired number of these stations in a net.

(3) Each such station over a separate telephone line manned by a separate operator if desired.

A single switching device (cordless switchboard or switchkey set) of suitable capacity may serve for both order and intelligence nets.

■ 245. SEARCHLIGHT COMMUNICATIONS (see fig. 8).—*a.* Searchlights are normally operated by distant electric control (D. E. C.) from a station remote from the light. The controller is located in the command post of the groupment or group to which the searchlight is assigned or in such other station as may be desirable. The communication system should permit telephone direction and control of each light from any observation station or command post from which the exercise of such functions may be desirable. This requires that the system be designed to provide—

(1) Continuous communication between each light and its controller operator.

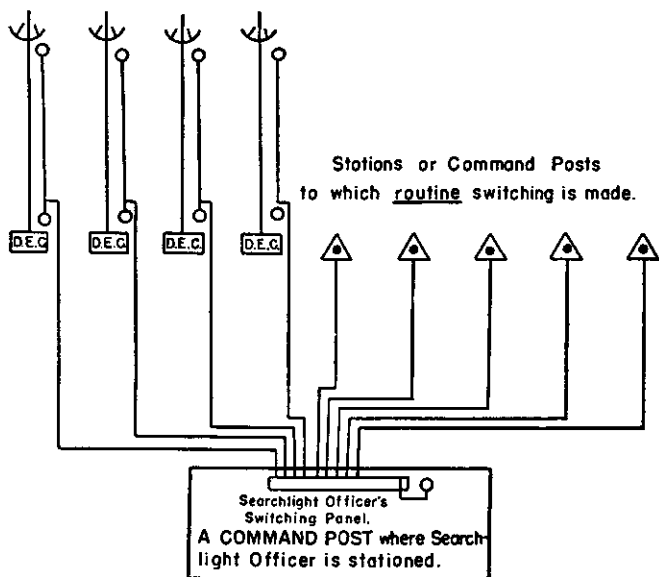


FIGURE 8.—Typical searchlight communications.

(2) Direct communication between the searchlight officer, each light, and its controller operator.

(3) Direct communication between the searchlight officer and any desired number of lights simultaneously.

(4) For those observing stations and command posts commonly utilized for control of searchlights, an extra or spare telephone which may be connected to the line connecting the light with its controller operator at the will of the searchlight officer. At command posts this line should be connected also to the commander's switching device.

b. This flexibility in searchlight communication permits tactical commanders to exercise searchlight direction at all times and permits searchlight control to be delegated to subordinate commanders when desired. It permits utilizing all available searchlights to best advantage in meeting changing tactical requirements.

c. Routine switching to provide this flexibility should be performed by the searchlight officer by use of a switching panel or cordless switchboard in the command post where he is stationed.

■ 246. COMMUNICATIONS WITHIN BATTERY (see fig. 9).—*a.* For command purposes the battery commander has two nets, an observer's net connecting the command post with the observers and the plotting room, and an order net connecting the command post with the plotting room and each emplacement. A separate intelligence net is not installed since the observer's net performs most of its normal functions.

b. For transmitting position-finding data, a line is provided from each reader at an observation station to the corresponding plotting-board armsetter. For observation of fire similar lines are provided from each spotter to the corresponding spotting board armsetter. For long-range batteries and other batteries having several observing stations, flexibility should and can be provided by means of switching devices so that any two observing stations and any two spotting stations may be connected to the plotting board and spotting board, respectively. This routine switching should be decentralized by use of suitable switching devices in the plotting rooms. However as in other cases where routine switching is decentralized it should be practicable to do this switching in an emergency at the fire-control switchboard. For an emergency it is advisable to consider facilities for transmitting position-finding data to or receiving position-finding data from any other battery in the group.

c. Firing data may be transmitted from the plotting room to the emplacements by electrical or mechanical data transmission systems or by telephone. When the telephone is used there is provided a range or elevation net and a deflection or azimuth net in each of which data are transmitted simultaneously to all emplacements. Where guns are so widely dispersed as to require relocated data separate lines are provided to each emplacement. Firing signals are provided for mortar batteries.

d. Miscellaneous telephone lines which are required for some batteries include checkback lines from emplacements to

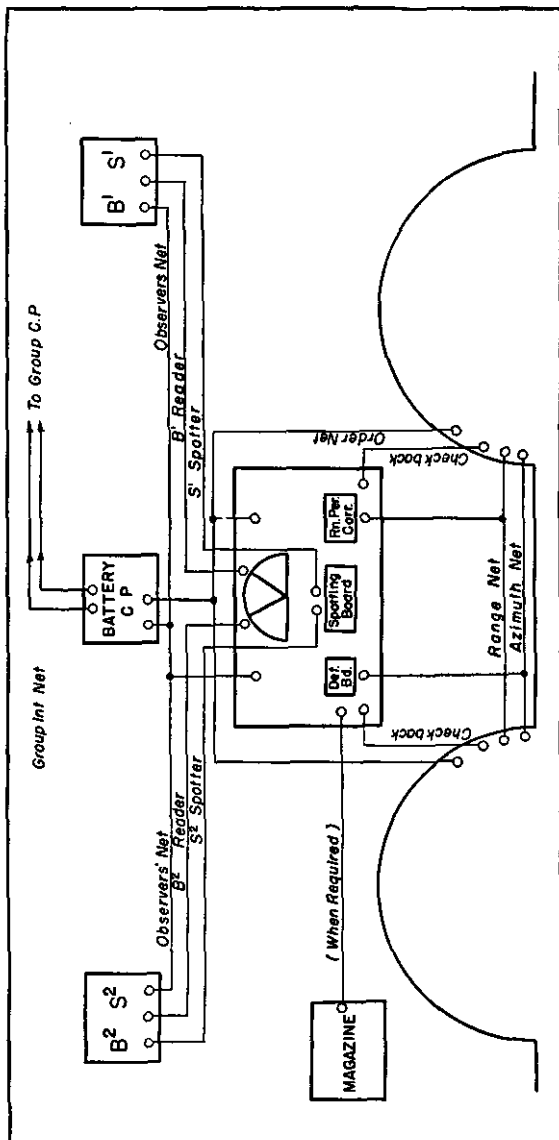


FIGURE 9.—Fire-control telephone system for a fixed battery.

NOTE.—Checkback line installed in mortar batteries only. Additional observing and spotting stations are connected in a manner similar to the stations shown. Time interval lines are not shown.

plotting rooms, lines to magazines and powder rooms, and lines to mortar battery commander's stations for reporting predictions.

SECTION III

SIGNAL COMMUNICATION FOR MOBILE SEACOAST ARTILLERY

■ 247. FIRE-CONTROL SIGNAL COMMUNICATION.—*a.* The general scheme of fire-control signal communication is similar to that for fixed artillery. However, certain modifications must be made in adapting the general system to needs, capacities, and characteristics of mobile units.

b. Regardless of the place of employment, mobile seacoast artillery is organized and employed generally in the same way as fixed seacoast artillery. Fire-control communication equipment, however, should provide for a mobility equal to that of railway or tractor-drawn armament to be served. Installations are normally of a temporary character, operators will have little if any protection from the weather, and all equipment and line material must be restricted to the minimum practicable weight and size. Communication systems of mobile seacoast artillery units attached to a harbor defense must be interconnected with the fire-control telephone system of the harbor defense for command and intelligence purposes. In many cases mobile seacoast artillery that is included in the fixed harbor defense project will be provided with all or part of a permanent communication set-up. Other reinforcing mobile seacoast artillery units may have to provide all its signal communication, or it may be that certain cable pairs and observation stations of permanent fixed defenses may be available for its use.

c. Local battery telephones are used because the weight and bulk of apparatus required for a common battery telephone system would be inconvenient for railway artillery and quite prohibitive for tractor-drawn units.

■ 248. GROUPMENT AND GROUP COMMUNICATIONS.—*a.* Communications for groupments and groups conform in general to those for fixed seacoast artillery. During initial phases of installing the communication net or in an emergency in order to expedite communication, it may be advisable to defer in-

stalling the intelligence net until all other communication lines have been installed. The order net can be used for intelligence messages during the period that the intelligence net is nonexistent.

b. Field wire systems are not as flexible as the permanently installed common battery fire-control systems of fixed artillery. A certain amount of flexibility is however essential. Failure of field wire lines and destruction or blinding of observation stations might require a mobile battery to obtain position-finding data from another battery in the battalion. The simplest way of providing this flexibility is to provide two extra lines from the battalion switchboard to each battery switchboard.

■ 249. COMMUNICATIONS WITHIN MOBILE BATTERY (see fig. 10).—a. For command purposes, the battery commander has a single order net connecting the battery commander's station with the plotting room and with the battery executive at the gun position. To minimize the amount of field wire to be laid the observers' lines are eliminated. Only two lines are laid to each observing station, one for the reader and one for the spotter. The two readers' lines are routed through the battery commander's station where they are connected to a 4- or 6-drop switchboard. The battery commander then uses the operator's set of the monocord switchboard to assign targets to observers. In order that the observer may receive commands and be able to hear the time interval signals, he is provided with a head set connected to the reader's telephone in parallel with the reader's head set. The observer's head set should be provided with a push button cut-out switch or the transmitter wire of the cord should be disconnected to reduce transmission losses while the reader is transmitting data.

b. As in fixed artillery, firing data are normally transmitted over a range or elevation net and a deflection or azimuth net. When the tactical situation requires that platoons of a tractor-drawn battery or guns of a railway battery be dispersed, separate lines are furnished for each gun or platoon that requires relocated data.

c. The field telephone equipment used in fire-control systems of mobile seacoast artillery units is described and regu-

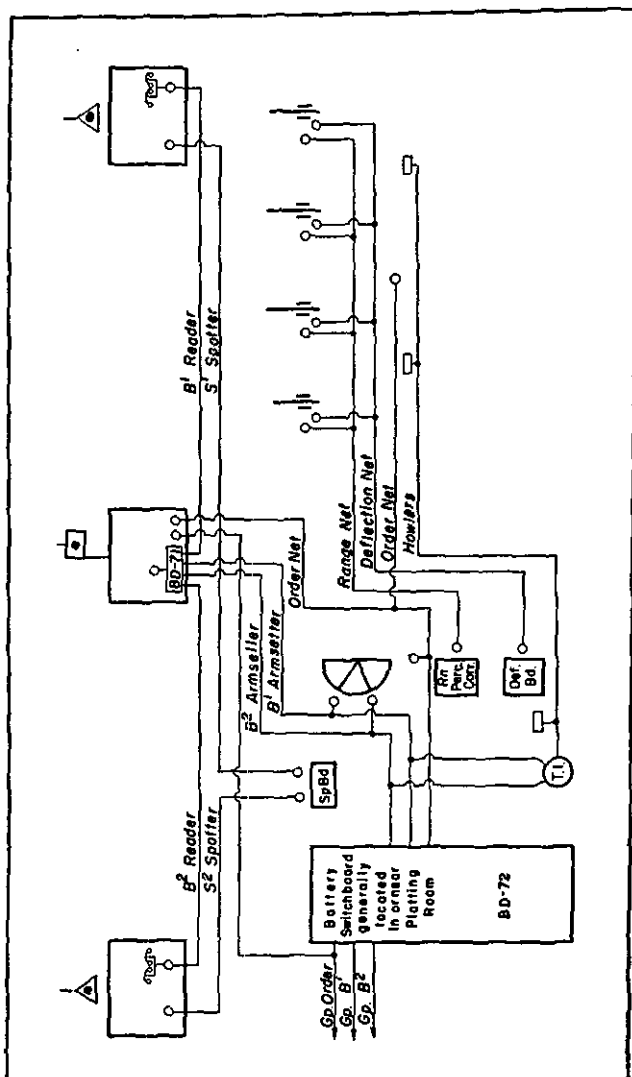


FIGURE 10.—Typical fire-control telephone system for a mobile battery.

lations for its installation, operation, and maintenance are given in FM 24-5. Utilization of this equipment to meet any particular situation will require considerable study. General rules to be followed in planning a field fire-control system have been given. These rules may require considerable modification to meet a particular tactical situation. For example, the battery commander's station may be so located that routing the reader's lines through the station would result in a system difficult to install and unnecessarily vulnerable. In such a case it would be more advantageous to connect the reader's lines temporarily into the order net at the battery switchboard for designation of targets, or to use a special line laid from the battery commander's station to the battery switchboard for that purpose. Other modifications may be indicated by local conditions. Thus the battery commander's station and one of the base-end stations may be consolidated with consequent simplification of the system when terrain favors such disposition.

d. Group order and intelligence nets are connected to the battery switchboard in the plotting room and also to the battery commander's station so that orders and intelligence may be received in either or both places.

■ 250. FIELD TIME INTERVAL SYSTEM.—Mobile seacoast artillery employs a standard time interval system differing somewhat from that employed in fixed defenses. This system economizes on the number of wire circuits by impressing a time interval tone on the reader's lines. The time interval signal at the guns is provided by a howler which is similar to an electric automobile horn.

SECTION IV

RADIO

■ 251. EMPLOYMENT.—a. The wire telephone is the primary means of communication in seacoast artillery. Radio is the most important auxiliary means. For certain purposes, where wire communication is impossible, radio becomes the primary means. Although radio telegraphy is normal, the radio telephone has certain limited uses for short range communication when secrecy is not essential.

b. Radio is the primary means of communication with—

(1) Naval patrols.

(2) Airplanes engaged in position finding or observation of fire.

(3) Mine planters and other harbor defense vessels.

c. Radio is an auxiliary means of communication in—

(1) Harbor defense and groupment tactical nets.

(2) Tactical nets of higher units such as subsectors.

(3) Communication with adjacent naval elements, with Army or Navy airdromes, and with local Army elements.

d. Rules governing radio communication in tactical nets of the Army and between the Army and the Navy are contained in "Joint Army and Navy Radiotelegraph and Radiotelephone Procedure, 1936," and other joint pamphlets.

SECTION V

MESSAGE CENTERS

■ 252. GENERAL.—Organization and operation of message centers for seacoast artillery are in accordance with the provisions of FM 24-5, except as indicated below.

■ 253. FIXED SEACOAST ARTILLERY.—a. Several factors combine to make message centers of harbor defense units less elaborate as to organization and operation than is indicated in FM 24-5. These factors are—

(1) The comprehensive telephone system of the harbor defense and the practicability of utilizing commercial wire lines for connecting the harbor defense with the headquarters of higher and associated units.

(2) The fact that orders for seacoast artillery during action are habitually telephonic between the commanders concerned, appropriate records being kept at sending and receiving stations.

b. A small message center is usually sufficient in the harbor defense primarily to receive and transmit messages sent by messenger, to encode or decode messages sent by radio or other means, and to handle administrative or other messages and reports sent by telephone or otherwise.

■ 254. MOBILE SEACOAST ARTILLERY.—Message centers for mobile seacoast artillery units are employed in the same manner as in fixed seacoast artillery.

CHAPTER 14

SEACOAST ARTILLERY INTELLIGENCE SERVICE AND LIAISON

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SECTION I

INTELLIGENCE SERVICE

■ 255. GENERAL.—*a.* The fundamental considerations of combat intelligence enunciated in FM 30-5 (now published as BFM, Vol. X, pt. one) apply to coastal frontier defense. A major invasion of a coastal frontier will be combined action by naval and land forces. The presence of the two hostile elements increases the threat of each to the defender and requires him to obtain accurate and complete information with reference to each. While during various phases of a joint attack against a coast one or the other of the attacking forces (naval or land) may temporarily constitute the principal threat against the defender, it is by a combined action that the attacker expects victory. The defender must collect and evaluate information and disseminate intelligence with this fact in mind. From study of hostile naval activities future activities of land forces often may be accurately predicted, while frequently actions of land forces forecast coming naval events.

b. Since the Coast Artillery is charged specifically with defense against hostile naval action, it follows that it is primarily interested in information with reference to the hostile navy. However, as it is also given the mission of assisting by artillery fire in repelling invasion by hostile and land forces, it has very vital interest in information of the enemy's land

forces while they are at sea, during a landing attack, and after hostile landing has been effected. Information is also required regarding enemy aerial activity in order that proper defensive measures may be planned and executed prior to hostile air operations.

c. The following paragraphs will be devoted largely to intelligence with reference to hostile naval activities in coastal frontier defense.

■ 256. COUNTERINFORMATION.—The intelligence service of any command is not only charged with the duty of collecting, evaluating, and disseminating information of the enemy, but is also responsible for initiation of measures necessary to prevent the enemy from securing information of our plans and activities by means other than combat. This counter or negative intelligence function is at times a very important one. It includes the employment of counterespionage, censorship, cryptographic security, and other measures necessary to deny information to the enemy. Counterinformation measures are normally the responsibility of higher commands, hence, when a seacoast artillery unit is closely linked into the subsector or sector organization, these measures are not ordinarily a seacoast artillery function. When seacoast artillery is acting alone, counterinformation measures will be a duty of its intelligence and communication services. See FM 30-25.

■ 257. ORGANIZATION.—a. Seacoast artillery intelligence service consists of all intelligence details and agencies within the defended area, whether operated by harbor defense, groupment, group, or battery personnel. It is not a separate organization, however, and has no independent chain of command or communication. Likewise, seacoast artillery intelligence service is a part of the intelligence services of the various higher echelons, including subsector, sector, and coastal frontier commands.

b. Intelligence sections or details which are agencies of, and subordinate only to, their several commanders are provided for all seacoast artillery tactical units from the harbor defense down to include the group. The number of officers and enlisted men assigned to this duty varies with the size of the unit, but the number must be sufficient to enable the intelligence personnel to accomplish their mission. These

details comprise observers and a small office force consisting of clerks, draftsmen, telephone operators, and orderlies. They operate under the unit (group, groupment, or harbor defense) intelligence officer. Battery intelligence functions are performed by the battery officers and battery observation, reconnaissance, and communication personnel.

c. When a regiment is assigned to duty within a particular harbor defense its regimental and battalion details are usually reassigned to corresponding harbor defense, groupment, or group details as best meets the particular situation.

SECTION II

SOURCES OF INFORMATION

■ 258. SEACOAST ARTILLERY SOURCES.—*a.* Information which seacoast artillery intelligence service will be able to collect directly will be limited to that which may be secured from operation of—

(1) Terrestrial observation stations.

(2) Vessels under control of the seacoast artillery commander.

(3) Air Corps elements forming a part of or operating in conjunction with the seacoast artillery command.

(4) Subaqueous sound-ranging installations when available.

(5) Underwater listening posts when available.

b. Terrestrial observation stations pertaining to tactical elements of the command function continuously to maintain surveillance of the defensive coastal area. These stations may be supplemented by other observation stations established for operation directly under the commander. Information collected from any terrestrial observation station is immediately transmitted directly to the command post of the element to which the station pertains.

c. Harbor defense vessels.—(1) Mine planters and other vessels assigned or attached to a harbor defense may operate within the defensive coastal area. Operations of these vessels will be concerned principally with controlled mine fields and other subaqueous installations of the harbor defense. However, in connection with such operations these vessels maintain a continuing observation of the water area, and report

by radio to shore station any information or intelligence which they may gather.

(2) Use for intelligence purposes of mine planters or other vessels assigned or attached to a harbor defense will be especially advantageous at night and during periods of low visibility. In those cases where for any reason surveillance activities of naval local defense forces are restricted or reduced, use of harbor defense vessels for this purpose becomes essential.

d. Air Corps.—In order to extend observation of water areas contiguous to a defended area to seaward beyond distances permitted from terrestrial stations alone, one or more flights of observation aviation may be provided each harbor defense to operate in conjunction with seacoast artillery for local surveillance and aerial spotting.

e. Subaqueous sound-ranging units assigned or attached to harbor defenses normally will operate directly under the commander. In particular cases where circumstances warrant the action, direction of these units may be delegated to groupment or group commanders.

f. Underwater listening posts are used to maintain constant listening surveillance to the limits of their radius of action during hours of darkness, and at times when visibility from shore and from the air is reduced by fog or other cause.

■ 259. AUXILIARY SOURCES.—*a. Auxiliary sources* from which seacoast artillery intelligence service may receive information are—

- (1) Naval inshore patrol.
- (2) Local shipping.
- (3) Naval district headquarters.
- (4) Higher and adjacent headquarters.
- (5) Prisoners of war, deserters, and civilians.
- (6) Enemy documents and matériel.
- (7) Hostile and neutral press and literature.

b. The inshore patrol, as one of its missions, patrols outer limits of the defensive coastal area in order to convey prompt and full information of approach of friendly or hostile vessels, including all those of the offshore patrol. This information is conveyed directly to the nearest seacoast artillery element charged with maintaining contact with the inshore patrol.

c. Collection of information obtained by local fishing and other commercial craft is normally a function of the inshore patrol. The seacoast artillery intelligence service may, however, receive this information direct from these agencies.

d. *Reports from offshore patrol* and other naval forces are received through the headquarters of the Naval District or the senior naval officer in the area.

SECTION III

COLLECTION OF INFORMATION

■ 260. **ESSENTIAL ELEMENTS OF ENEMY INFORMATION.**—a. Essential elements of enemy information constitute that information of the enemy which a commander must have to make a decision or to enable his staff to formulate details of a plan.

b. Essential elements of enemy information are designated for the *purpose* of focusing attention and activities of all intelligence agencies on that information which from the command point of view is most important at that particular time. These agencies then concentrate on getting necessary information *in time for it to be of value*.

■ 261. **INFORMATION DESIRED.**—Enemy information desired covers a wide range of subjects but in general it may be considered under the following headings:

a. *Enemy's nearest elements.*—This should include location and number of elements, their types, characteristics, and action.

b. *Enemy's strength, disposition, and movements.*—The following information is desired relative to the enemy's strength, dispositions, and movements. Certain information called for in this paragraph may be omitted when it has been considered previously.

(1) *Elements in contact* includes the number of ships, their location, type, armament, speed, whether or not they are a part of a larger force, and their combat efficiency.

(2) *Reserves* includes the number of ships, their location, type, armament, speed, direction of movement, and time it will take them to get into action. Because of mobility of

naval forces, all enemy elements which can be utilized in an operation regardless of location must be considered as potential reserves. Information as to which elements can and will be utilized is therefore of first importance, and from such information deductions are made as to the enemy's reserves available for a particular operation.

c. Enemy's bases, supply, and equipment.—In no form of warfare is the tactical situation more closely allied to the supply situation than in attack on a coast. Under favorable conditions land forces may live off the country for a considerable time but a naval force can exist but a short time without a base. Information under this heading includes location of enemy's bases, their facilities for shelter, supply, and repair of the fleet, their practicability as bases for hostile operations, status of reserve supplies, method of supply from home ports and adequacy thereof, measures adopted for protecting the line of communications, availability or nonavailability of other bases, and whether or not advance bases, particularly air bases, are susceptible to attack by our own air forces.

d. Weather and visibility.—Information of weather and visibility at the time, and forecasts for the future are vital, in that frequently such conditions will be controlling factors on the enemy's operations. In particular, what the strength and direction of the wind is, whether smoke screens will be effective, and whether landing operations will be practicable.

e. Enemy's operations.—It is necessary to collect information of combat activities of the enemy in order to learn his tactics and to indicate his possible lines of action. Information desired usually includes—

(1) *Capital ships.*

Formations used.

Are they aggressive or cautious?

Targets and ranges at which engaged.

Use of direct and indirect fire.

Use of smoke screens.

Type (high angles or flat trajectory) and caliber of guns employed and kinds of projectiles used.

Do they use gas?

(2) *Cruisers.*

Formations used.

Are they aggressive or cautious?

Targets and ranges at which engaged.

Use of direct and indirect fire.

Type (high angle or flat trajectory) and caliber of guns employed and kinds of projectiles used.

(3) *Destroyers.*

Formations used.

Are they aggressive or cautious?

Targets and ranges at which engaged.

Are they used independently or in conjunction with other elements of the fleet?

(4) *Submarines.*

Are they aggressive or cautious?

How are they being used?

What have they accomplished?

(5) *Mine sweepers.*

Are they aggressive or cautious?

Where are they operating?

How do they operate?

What have they accomplished?

(6) *Mine layers.*

Are they aggressive or cautious?

Where are they operating?

Character of mines laid.

What have they accomplished?

(7) *Air forces and airplane carriers.*

Is the aviation aggressive or cautious?

What flights have been made over us?

Types of planes used and how armed.

Size and type of bombs employed.

What was apparent purpose of each flight?

What information was probably obtained?

Did they operate from ships or advanced land bases?

How are carriers employed?

(8) *Auxiliaries.*

Where are they operating?

What have they accomplished?

(9) *Transports.*

Which are carrying combat troops?

Which are carrying military equipment and supplies?

Where are they located?

Are they concentrated or dispersed?

What troops are aboard (estimated strength and character)?

What activities are taking place with view to debarking or embarking troops?

Facilities for debarking or embarking troops (types and sizes of landing boats available).

f. Enemy casualties (including ships sunk, disabled, damaged, and captured).—Information under this heading should include in addition to names and types of ships affected—

(1) Place, cause, and time of sinking.

(2) Cause and degree of disability and probable length of time before each will be fit for combat.

(3) Extent of damage and degree to which it affects combat efficiency of ships.

(4) Time, place, and disposition of each captured ship.

g. Hydrography as it affects probable enemy operations.—

(1) Tides, currents.

(2) Channels, depths. Possible anchorages for transports.

(3) Are water approaches to beaches obstructed by kelp, coral, rocks, or surf?

h. Terrain as it affects enemy's probable landing operations.—(1) Location of beaches suitable for landing operations and conditions under which such beaches can be used.

(2) Can enemy operate effectively after landing?

(3) Capacity of each beach.

(4) Location of defensive wire entanglements.

i. Enemy's knowledge of our situation.—(1) Reconnaissance, naval and airplane.

(2) Prisoners and documents lost.

(3) Espionage.

j. A local commander will be unable to collect all preceding information with facilities under his command. A great deal of it must come from higher headquarters collected through

agencies of the War Department. Other information will come from Army and Navy airplane patrols. Reports from the offshore patrol will be received through headquarters of the naval district. For reports from elements of the inshore patrol, the most direct possible communication is desirable between naval elements and army elements vitally interested. Arrangements are therefore made whereby such reports may be received direct by harbor defense, groupments, groups, or even batteries as the situation may warrant, radio reports being made in conformity with joint Army and Navy radio telegraph and radio telephone procedure. Information which a local artillery commander will be able to collect directly usually will be limited to that which can be secured from his observation stations and from such aviation as may be under his command or directed to operate in conjunction with him. Within his capabilities he is responsible for securing information concerning the enemy's forces opposing him.

SECTION IV

EVALUATION OF INFORMATION

■ 262. **GENERAL.**—After collection, enemy information is subjected to a critical and systematic analysis for the purpose of determining its probable accuracy, significance, and importance. Evaluation and interpretation of enemy information are discussed in FM 30-5 (now published as BFM, Vol. X, pt. One).

SECTION V

DISSEMINATION OF INFORMATION

■ 263. **GENERAL.**—Dissemination of military intelligence is as essential as its collection and evaluation. Military intelligence is of no value unless it reaches the individual or units concerned in time to serve its purpose.

■ 264. **CLASSIFICATION.**—Intelligence which should be disseminated may be divided into two classes: first, that which should be placed in the hands of the commander, other sections of the staff, higher, lower, or adjacent units without

delay; and second, intelligence which may be included in periodic reports. Intelligence officers must decide what items of intelligence belong in each class. It may be stated as fundamental however that in all doubtful cases, immediate dissemination is made. There is no objection to including in a periodic report intelligence of the first class which has already been given to the persons most concerned. Initial appearance of a hostile vessel or fleet should be reported to higher and adjacent or supporting units at once by the most direct means available. Each intelligence officer must decide on form and method of dissemination.

■ 265. TRANSMISSION.—In order to insure timely alerting of all or part of his command for action, the seacoast artillery commander must prescribe suitable means which will facilitate immediate transmission of information of high priority. Within the harbor defense the normal method of transmitting information is by the telephone system installed and operated by harbor defense and subordinate units. The harbor defense radio supplements the telephone where necessary. Radio messages follow the same form as telephone messages. Seacoast artillery units establish such teletype, telephone, or radio communication with outside agencies and adjacent units as may be prescribed in the plan of signal communication of the next higher commander, or as may be necessary for mutual exchange of intelligence.

■ 266. OBSERVERS' REPORTS.—a. Observers' reports are statements of fact in the fewest possible words consistent with clarity, and in general include the following information given in the order listed:

- (1) Number of vessels.
- (2) Type.
- (3) Formation.
- (4) Location.
- (5) Direction of movement.
- (6) Observation point.

b. Observers' reports should be limited to use of *standard expressions* as follows:

(1) *Number of vessels*.—"One," "two," "five," or where the number cannot be counted quickly, "several" or "many" may be used.

(2) *Type*.—Battleships, cruisers, destroyers, submarines, commercial vessels, airplane carriers, mine layers, tankers, tramp steamers, schooners, motorboats, or other types. Where the type may not be determined readily, the general terms "war vessels," "commercial vessels," "sailing ships," or simply "vessels" may be used. Such descriptive words as "small" or "large" may be used where the type may not be determined. Ability of observers to determine types readily should be insured through proper training.

(3) *Formation*.—Line, column, line of bearing, column of divisions, line of divisions, line of sections, line of bearing of divisions, column of divisions, ships on line of bearing. In the case of a single vessel this element of the report is inapplicable. In case the formation is not sufficiently defined to fall within a category the general term "random" may be used.

(4) *Location*.—Location may be given in terms of range or azimuth from an observation post, or in terms of the name of the water area in which the targets appear and the range. Intelligence officers in forwarding this information report location by means of the battle chart, using squares and azimuths and ranges.

(5) *Direction of movement*.—The direction in which the vessel is moving with reference to the observer as coming in, going out, going east (north), passing from left (right) to right (left), or if the vessel is not moving, stationary.

(6) *Observation point*.—Designation of the observation point from which the report was received must be included in order that location and direction of movement reported may be correctly interpreted. This is especially important if the location is given in terms of azimuth and range or water area and range.

c. When nature of the activity observed makes the preceding form of report clearly inapplicable (for example, observation and report of some activity ashore in vicinity of observer, or continuing reports with respect to action and movements of an observed and reported vessel or vessels), technique of the report will be governed by instructions of the responsible commanders.

SECTION VI

INTELLIGENCE DOCUMENTS

■ 267. INTELLIGENCE (S-2) WORK SHEET.—*a.* Information arriving in the intelligence section should be classified and kept available for ready reference. No special form is prescribed for this purpose. However, experience indicates that a practical method is to enter items in a loose-leaf binder with separate pages corresponding to the headings of the outline for S-2 Periodic Report (par. 273c).

b. The purpose of the work sheet is to arrange information coming into the intelligence office so that everything bearing on a particular subject will be grouped together for ready reference and comparison. It is not a permanent record.

■ 268. INTELLIGENCE (S-2) SITUATION MAP.—*a.* The intelligence (S-2) situation map is a map kept by the intelligence section of each combat unit upon which all available information of the enemy is graphically recorded.

b. Provision should be made for keeping the map *continuously posted* by periodic entries at suitable intervals. A battery conducting fire against naval vessels will make entries on its plot at the regular observing interval, and the plot with suitable explanatory notes will serve as its situation map. The situation map of a seacoast artillery commander will frequently indicate movements of many hostile naval vessels or groups of vessels but at longer observing intervals.

c. The intelligence (S-2) situation map is usually combined with the operations (S-3) map in seacoast artillery practice. Tracings or copies of the situation map showing the situation as known at the close of the period may be used as annexes to accompany the periodic intelligence reports.

■ 269. INTELLIGENCE (S-2) JOURNAL.—The intelligence (S-2) journal is a daybook of the intelligence section of each unit. It is kept by all units down to and including the group. It contains briefs of important intelligence messages received and sent, and notations of periodic reports, orders, and similar matters that pertain directly to the section. If items are received or issued in verbal form, entry in the journal is usually

detailed, but if it is a document, entry may be a reference thereto and a synopsis only. The journal is kept as a permanent record and should be considered as the main and primary record of the section. For this reason entries are made immediately on receipt of the report of an event and should not be changed, although they may be supplemented by subsequent entries. The journal is closed daily or at the end of a phase or period, and one copy of it is turned over to the operations section for consolidation with its journal. It is supported by a file of original messages, pertinent orders, and reports. It is kept in the form shown in FM 101-5, or in any other convenient manner. Whatever the form, the journal should be an index to the message file.

■ 270. INTELLIGENCE (S-2) FILE.—The file of messages sent and received is very important. A separate file is kept of all information that may be of future value.

■ 271. INTELLIGENCE (S-2) ANNEX.—*a.* The intelligence (S-2) annex serves as a directive for intelligence activities of the command. It is issued to amplify the field order when reconnaissance missions are so numerous as to lengthen unduly the field order. In the annex instructions for each collecting agency are collected in one paragraph devoted to that agency. When issue of an annex is impracticable or will delay timely receipt of information, reconnaissance instructions should be included in paragraph 3 of the field order or be issued as fragmentary messages directly to the agency concerned.

b. At the beginning of a campaign a complete annex may be issued. Succeeding annexes omitting paragraphs in which there is no change are issued as needed to accompany field orders.

c. The intelligence (S-2) annex is published by harbor defenses or equivalent seacoast artillery and larger units only. In harbor defenses intelligence annexes are prepared during peacetime as a part of the harbor defense plans, and accompany the initial field order issued by the harbor defense.

d. A form for an intelligence annex is given in FM 101-5.

■ 272. BATTERY UNIT REPORTS.—At times designated by the group commander, each battery submits a detailed report

which is in effect a combined intelligence and operations report. It consists of a chart, usually an overlay for the fire-control map, on which is marked the course of each hostile formation in the battery's zone of action, accompanied by a tabular statement of the following:

- a. Serial number of formation as shown on chart.
- b. Time of arrival and departure.
- c. Description of formation (number and type of ships or airplanes).
- d. Rounds fired.
- e. *Remarks.*—Effect of fire action; character of hostile operation.

■ 273. INTELLIGENCE (S-2) REPORT.—a. The intelligence (S-2) report is an intelligence document that sums up intelligence which has been collected and evaluated during a given period. It is usually supplemented by a situation map or overlay. The period of time covered by this report is prescribed by higher headquarters, or by the commander of the unit in absence of such instructions. It is a convenient means of keeping higher, lower, or adjacent units informed of the enemy situation as determined by the unit preparing the report. It frequently will contain information which because of its importance has already been disseminated by means of special messages.

b. During action or maneuvers, groups, groupments, and harbor defenses submit periodic intelligence reports. Sub-sector commanders may prescribe that seacoast artillery send reports by telegraph at specified times. Copies to other headquarters may be sent by mail, messenger, or other means.

c. The form for the S-2 report is given below. This form is for use as a guide only. Any item not applicable should be omitted.

AN OUTLINE FOR A G-2 OR S-2 PERIODIC REPORT

From: (Date and hour)

To: (Date and hour)

Title
Place
Date

No. _____

Maps:

1. ENEMY'S NEAREST ELEMENTS.

- a. Naval forces.
- b. Land forces.

2. ENEMY'S STRENGTH, DISPOSITION, AND MOVEMENTS.

- a. Naval forces.
 - (1) Elements in contact.
 - (2) Reserves.
 - (3) Other forces capable of intervention.
 - (4) Changes since last report.
 - (5) Movements.
 - (6) Naval air forces.
- b. Land forces.
 - (1) Units in contact.
 - (2) Reserves.
 - (3) Other forces capable of intervention.
 - (4) Changes since last report.
 - (5) Movements.
 - (6) Army air forces.

3. ENEMY'S BASES, SUPPLY, AND EQUIPMENT.

- a. Naval (including air).
- b. Land (including air).

4. WEATHER AND VISIBILITY.

5. ENEMY'S OPERATIONS DURING PERIOD.

- a. Naval.
 - (1) Capital ships.
 - (2) Aircraft carriers.
 - (3) Cruisers.
 - (4) Destroyers.
 - (5) Mine sweepers.

- (6) Mine layers.
- (7) Submarines.
- (8) Air forces (naval and military).
- (9) Transports.
- (10) Auxiliaries.
- (11) Miscellaneous.
- b. Land forces.
 - (1) Cavalry (including mechanized forces).
 - (2) Infantry and auxiliary weapons.
 - (3) Artillery.
 - (4) Antiaircraft artillery.
 - (5) Chemical warfare.
 - (6) Aviation.
 - (7) Marines.
 - (8) Miscellaneous.
- 6. MISCELLANEOUS.
 - a. Naval forces.
 - (1) Estimated enemy casualties.
 - (2) Hydrography and terrain as it affects enemy probable naval and landing operations.
 - b. Land forces.
 - (1) Estimated enemy casualties.
 - (2) Enemy defensive organization.
 - c. Terrain as it affects enemy.
 - d. Any enemy intelligence not specifically covered by headings of this report.
- 7. ENEMY'S KNOWLEDGE OF OUR SITUATION.
 - a. Observation.
 - b. Reconnaissance.
 - c. Prisoners and documents lost; inhabitants; espionage.
- 8. CONCLUSIONS.
 - a. Enemy capabilities that may affect accomplishment of mission of the command.
 - b. A brief discussion under each capability of factors in the situation favoring or restricting the enemy if he adopts that capability.

(Signature of chief of section)

d. In preparing an S-2 report needless repetition should be avoided. For example, types and characteristics of enemy naval vessels are called for under paragraph 1, "Enemy's nearest elements." The same information is called for under paragraph 2, "Elements in contact" and "Reserves." In this case when the information is completely covered in one paragraph no useful purpose is served by repeating it in another. On the other hand, it is essential to complete understanding of the report that certain information appear in two or more paragraphs. When information is given in detail in one paragraph and it is necessary to repeat it, repetition should be in the briefest form consistent with clarity. An example of this type of information is "Enemy's casualties." A description of enemy operations would be incomplete without reference to casualties suffered. At the same time, in order that the reader may at a glance determine casualties suffered by the enemy during the period and effect thereof, a special paragraph is devoted to concise summing up of the information.

SECTION VII

LIAISON

■ 274. GENERAL.—*a.* Liaison is the connection between units or other elements involved in coastal frontier defense in such a manner as to insure a spirit of understanding and attainment of effective cooperation. It is accomplished by sending an officer of the command, with or without assistants, to the headquarters of the commander with whom liaison is to be established, to remain there until the need for liaison no longer exists. Its purpose is to insure the most effective mutual support of seacoast artillery and other elements of defense, to give technical advice, and to secure first-hand information for the commander. While liaison requires effective means of intercommunication between the commanders concerned, existence of signal communications alone does not constitute liaison. Liaison plans normally are prepared and supervised by S-3.

b. When liaison officers from higher or adjacent units are present at headquarters, it is a function of S-3 to furnish them with information as to the situation and the seacoast

artillery plan of action. He usually provides them with a separate room where a situation map is kept posted to date. Such officers are also furnished telephone or radio communication as may be necessary and possible.

■ 275. **COMMANDERS WITH WHOM ESTABLISHED.**—Commanders with whom a seacoast artillery commander establishes liaison may include any or all of the following, necessary details being made if and when required:

- a. Naval district commander.
- b. Inshore patrol commander.
- c. Local Air Corps unit commander.
- d. Local antiaircraft artillery commander.
- e. Local subsector and subordinate commanders.
- f. Adjacent seacoast artillery commanders.

■ 276. **AGENCIES OF LIAISON.**—*a.* Liaison officers and details constitute normal liaison agencies. However, liaison maintained through liaison officers cannot be thoroughly effective unless individual commanders attain a spirit of complete and harmonious cooperation through frequent personal visits and conferences.

b. Liaison officers are assistants to the staff. They are sent out for the purpose of procuring and transmitting promptly such information as is needed to insure the effective cooperation desired. They also act as tactical and technical advisers to the commander of the unit to which attached in matters concerning employment of seacoast artillery. In seacoast artillery units no specially trained liaison officers are provided. They normally are selected as needed from qualified officers whose services can best be spared for the purpose at the time.

CHAPTER 15

SUPPLY AND EVACUATION

	Paragraphs
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II. In a harbor defense-----	280-283
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SECTION I

SUPPLY METHODS AND TERMINOLOGY

■ 277. REFERENCE.—For general provisions covering supply and evacuation, see FM 100-10. Officers detailed on supply duty should refer to that manual for definitions and basic supply procedure.

■ 278. DAY OF FIRE.—Requirements in ammunition supply normally are expressed in "days of fire." A day of fire is an arbitrary unit of measure for ammunition supply expressed in rounds per weapon. It is based on the average expenditure of large commands in one day of combat. Thus, a day of fire for a 155-mm gun organization is 100 rounds per piece, while that of an 8-inch railway gun is 80 rounds per piece.

■ 279. LOCATION OF SUPPLY UNITS AND ESTABLISHMENTS.—*a. General.*—No exact rules for choice of locations for railheads, distributing points, train bivouacs, and similar establishments can be given. They should be sufficiently close to the troops they serve to be accessible, but they must be far enough to the rear to be removed from exposure to gunfire directed at the batteries and from danger of raiding parties. They should be concealed from aerial observation.

b. Rear echelon.—It is frequently necessary in combat for unit headquarters to operate in two echelons. When the headquarters is thus divided the rear echelon consists of that part of the headquarters charged with supply, maintenance, and administration. When a regimental rear echelon is established, the service battery of the regiment is the principal element thereof.

c. Bivouacs.—(1) The headquarters battery bivouac should be at or close to the command post.

(2) The train bivouac may be in the vicinity of the command post, near the railhead or distributing point from which supplies for the organization are obtained, or at some intermediate point. Where practicable, it should be located beyond effective range of hostile medium artillery. It should have suitable motor-road connections with the railhead or distributing point and the batteries it serves, and the site should provide suitable standings for vehicles, water, and protection from aerial observation.

(3) When batteries are in firing positions, battalion trains are assembled in rear of and convenient to battery positions, under cover, and if possible with covered routes of approach to the front.

d. Distributing points should be centrally located with reference to the troops they serve, and on a good motor road net leading both to the railhead and the unit train bivouacs. The class of supply handled may influence its location. Ammunition distributing points, for example, should be closer to batteries than rations distributing points in order to expedite supply of ammunition during combat.

e. Railway artillery car parks must be located where there is sufficient siding capacity. Important railroad centers are to be avoided because of danger of bombing attacks. Smaller railroad yards where cars may be somewhat scattered are desirable.

f. By whom located.—Location of many supply points will be decided by higher command, but decision may be based on the local commander's recommendation.

SECTION II

IN A HARBOR DEFENSE

■ 280. ORGANIZATION.—Service batteries and trains are not assigned to harbor defense regiments or battalions. Supplies are handled through the following members of the staff, each of whom is assisted by a detachment of either service troops or coast artillery troops detailed for that purpose; quartermaster, ordnance officer, artillery engineer, gas officer, and surgeon.

■ 281. SUPPLIES (EXCEPT AMMUNITION).—Issue of rations is automatic, based on the actual strength present in the same way as they are issued to mobile regiments. Requests or requisitions for other supplies are made by batteries to fort or harbor defense staff officer concerned. The supply element utilizes transportation facilities available to move these supplies either directly to batteries or to distributing points. Supplies may be distributed from warehouses of the supply department concerned with batteries furnishing their own transportation, usually hand carts.

■ 282. AMMUNITION SUPPLY.—Initial ammunition supply is based on approved defense projects. Projects prescribe quantities to be stored at each battery and types and amounts to be held in reserve in the harbor defense or other designated storage point. Ammunition will be moved from arsenals, factories, or depots direct to forts or their vicinity by rail or water or both, and thence moved to battery magazines by rail, water, or motor transportation, or any combination of these. Fort or harbor defense ordnance officers will be provided with necessary means (personnel and transportation) to effect delivery.

■ 283. EVACUATION.—Harbor defenses are provided with station hospitals, ambulances, and medical detachments. Since most station hospitals in harbor defense forts are in exposed locations, they will have to be evacuated and arrangements made to establish military hospitals in civilian hospitals or other buildings situated in safe locations. Evacuation from hospitals is a function of higher authority.

SECTION III

FOR MOBILE ARTILLERY

■ 284. SOURCE OF SUPPLY.—Supply for mobile seacoast artillery units ordinarily will be a function of the higher units to which they are attached.

■ 285. AMMUNITION.—*a. General.*—Where mobile seacoast artillery is employed in a harbor defense in accordance with defense projects, initial supply of ammunition will be based on those projects.

b. Railway artillery.—(1) Railway artillery is supplied with ammunition by rail, either directly from ammunition depots or from designated distributing points. During active operations the commanding officer of each railway artillery unit, from battery to regiment, inclusive, is required to submit periodical reports of ammunition expenditures to the next higher artillery headquarters. These reports are usually rendered daily and form the basis for allocation of ammunition. Actual distribution of ammunition to individual batteries is a battalion function and is taken care of by the battalion railway and munitions officer. For this purpose each battalion is provided with a locomotive and with ammunition cars. When in firing positions each gun has one or two ammunition cars on the track with it. Under normal conditions where action is probable, a minimum of 1 day of fire of ammunition should be available at the battery position. As these cars become empty they are replaced by full cars. The empty cars are delivered by the railway and munitions officer to the railway operating service at designated transfer points and full cars received to replace them. Movement beyond trackage released to artillery is a function of the rail transportation service; movement within regimental or battalion trackage area is a function of the regimental or battalion railway and munitions officer concerned.

(2) Additional reserves usually consisting of railway cars filled with ammunition, known as rolling reserves, may be established at convenient points. As an example, with action imminent 1 day of fire of ammunition may be held available on ammunition cars at the railway car park with an additional reserve at the refilling point. Under these circumstances provision should also be made for a supply of ammunition to be available on call for delivery to the refilling point.

(3) In emergency motortrucks of a railway unit may be used for ammunition supply, but this is difficult and unsatisfactory and should only be considered as a temporary expedient.

c. Tractor-drawn seacoast artillery is supplied with ammunition through distributing points located by higher authority. The battalion commander is responsible for requisitioning,

transporting, and delivering ammunition to batteries of his battalion. For this purpose he has a munitions officer who commands the ammunition train, the organization charged with transporting and delivering ammunition. The ammunition train receives ammunition at the designated distributing point and delivers it to battery positions. Under ordinary circumstances, with action imminent at least 1 day of fire should be dumped at battery positions, with another day of fire held on trucks or dumped on the ground at the ammunition train bivouac. Reserves of ammunition may be built up at the distributing points designated. Provision should likewise be made for an additional reserve of ammunition to be held available on call for delivery to the distributing point.

■ 286. SUPPLIES (EXCEPT AMMUNITION).—The regimental service battery is the agency provided for distributing supplies except ammunition throughout the regiment. It contains three battalion sections each commanded by a battalion supply officer so that when a battalion is detached from the regiment its section of the service battery may accompany it. The service battery is provided with motor transportation for distributing supplies from designated distributing points to all elements of the regiment.

■ 287. EVACUATION.—A medical detachment is attached to each regiment of mobile seacoast artillery. The detachment is provided with ambulances and aid station and dispensary equipment. In the field, casualties are given first-aid treatment at the battalion aid stations. Evacuation, if necessary, will either be direct from battalion and regimental aid stations by motor ambulance of the higher unit with which the unit is serving, or casualties will be sent by the unit itself to collecting stations from which the higher unit evacuates.

CHAPTER 16

PLANS AND PROJECTS

	Paragraphs
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II. Estimate of situation	290-291
III. Seacoast artillery defense plans	292-293

SECTION I

GENERAL

■ 288. DEFENSE PLANS.—A defense plan for seacoast artillery includes mission or decision of the commander and means and methods to be employed in accomplishing the mission. It is based on means actually available or definitely allocated by higher authority for inclusion in the defense plan. For harbor defenses defense plans covering a wide variety of situations are made during peace. Harbor defense plans may require little or no modification during war, but for other seacoast artillery commands such as mobile units not included in organized harbor defenses, defense plans must be made when such commands are assigned definite missions.

■ 289. DEFENSE PROJECTS.—A defense project for each harbor defense is a statement drawn up by a board of officers and approved by the Secretary of War of the material means available or authorized for accomplishment of assigned missions. It includes priorities for procurement and installation of means not available at the time the project was drawn up. It prescribes locations and tactical dispositions of matériel, fire-control installations to be provided, and details entire composition of the defense insofar as matériel is concerned. If certain available matériel is no longer to be used the project so states.

SECTION II

ESTIMATE OF SITUATION

■ 290. ESTIMATE OF SITUATION.—a. An estimate of the situation is preliminary to and the basis for preparation of any

defense plan or project. The estimate is not a part of the plan or project, but it should be filed as a reference to show the considerations upon which the plan or project were based.

b. Ordinarily the harbor defense commander's estimate of the situation is a continuing mental process leading to a decision when needed. In this estimate he considers his mission, conditions, means available to himself and to the enemy, and results possible as to future action. For further details, see FM 101-5. The harbor defense project prescribes disposition of matériel, while a decision as to general line of action to be followed usually is furnished by higher authority.

■ 291. FORM FOR ESTIMATE OF SITUATION.

1. MISSION.—Statement of the mission assigned by higher authority or deduced from instructions from higher authority or from knowledge of the situation.

2. SITUATION AND POSSIBLE LINES OF ACTION.

a. *Factors affecting possible lines of action.*—A suggested list of factors is given for consideration. They should be analyzed as to their influence on the choice of a line of action, and as to enemy capability to act adversely. Not all of the factors will have an important bearing in every situation.

(1) *Relative combat power.*—Arms and armament:

Naval fire power, including aviation.

Fixed and mobile artillery.

Accessories, obstacles, submarine mines.

Assistance from the Navy and adjacent troops.

(2) *Reinforcements.*

(3) *Time and space factors.*—Troop movement; time for installation of matériel.

(4) *Terrain and water areas:*

Observation.

Fields of fire.

Concealment and cover.

Avenues of approach; obstacles.

Routes of communication.

Terrain and hydrography in general.

Terrain features or water areas vital to accomplishment of mission.

(5) *Present distribution of forces.*

(6) *Status of supply and evacuation.*

(7) *Weather, climatic conditions, prevailing winds.*—Consider each applicable factor; state facts briefly and deductions as to effect of factor on enemy capabilities and on your choice of a line of action.

b. *Enemy capabilities.*—List in general terms possible enemy lines of action within his physical capabilities which can interfere with your accomplishment of your mission.

c. *Own lines of action.*—List in general terms reasonable and practicable lines of action open to you which will accomplish or facilitate accomplishment of your mission. In simple situations or in small commands, it may be possible to eliminate all but one of these lines of action by deductions made in paragraph 2a. In such event, analyses and comparisons of paragraphs 3 and 4 are omitted and the estimate completed by a statement of the decision.

3. ANALYSES OF POSSIBLE LINES OF ACTION.—Considering each combination, review mentally the result if each of your lines of action is opposed by each of the hostile capabilities. This is to discover strength or weakness of each line of action when tested against capabilities of the enemy. After each mental analysis, state briefly those conclusions which bear on your choice of a line of action.

4. COMPARISON OF OWN LINES OF ACTION.—Summarize advantages and disadvantages of your various lines of action and select the one possessing greatest merit. This process requires a review of deductions and analyses made in paragraphs 2 and 3.

5. DECISION.—The decision should state briefly and clearly the line of action adopted for the command as a whole to meet the situation. It must be so expressed as to constitute a basis of action for the command as a whole and as a directive for preparation of the defense plan. In scope, it may vary between wide limits, but the estimate at any definite time should result in a decision as complete as the situation warrants at that time.

SECTION III

SEACOAST ARTILLERY DEFENSE PLANS

■ 292. SEACOAST ARTILLERY DEFENSE PLANS.—*a. Characteristics.*—Essential characteristics of a defense plan are comprehensiveness, flexibility, and simplicity. All units of the command must be considered, as teamwork can be secured only by allotment of a task to every member of the team. To meet the situation at the time the plan is to be put into effect and to meet later changes in the situation, the plan must be flexible and subject to corresponding changes in its details. Finally, to insure the greatest chance of its successful execution, it must be simple since confusion, interrupted communication, and misleading information are normal in combat. Under conditions of modern warfare, the simplest plan clearly expressed in orders has the best chance of success.

b. Scope.—Whereas a project applies principally to obtaining and locating suitable matériel for a defense, a defense plan covers disposition of personnel and action to be taken by the defense force as a whole, as stated in the commander's decision, so as to provide for coordinated employment of all units of the command. In its entirety, the plan includes all matters which appropriately will appear as directives to the command or fractions thereof in field orders and in administrative orders, including annexes, pertaining to the defense.

c. For harbor defense command.—The defense plan of a harbor defense commander is based on the plan of the next higher commander where such plan has been promulgated, and should be in conformity with any applicable joint Army and Navy plan. The defense plan should include a scheme of defense to be put into effect on or before M-day, with provisions for the progressive development of the defense as additional means become available. An important element of the plan is a statement of the time of accomplishment of each item. The exact scope, contents, and form of the plan will depend on local conditions and requirements and may be prescribed by higher authority. Ordinarily, the plan will

consist of a basic plan, containing a complete general outline, and a number of annexes in which details of the plan are elaborated. When the entire plan is short, it may be simpler to include all details in the basic plan and omit the use of annexes. Although it is impracticable to prescribe a standard form for general use, a suggested outline is given in paragraph 294 for use as a guide or reminder list insofar as it is applicable to local conditions and not in conflict with procedure prescribed by higher commanders.

d. For other seacoast artillery commands.—Commanders of seacoast artillery other than in harbor defenses may or may not be required to consider certain details of defense that concern the commander of a harbor defense which may include numerous fixed installations and convenient local electrical power and other facilities. The former may be required to operate alone in organizing the defense of a certain coastal area or his command may be part of a larger command of all arms. The outline in paragraph 294 will serve as a guide to the artillery commander in formulation of his defense plan.

■ 293. CHECK LIST FOR A SEACOAST ARTILLERY DEFENSE PLAN.

1. *General plan.*—A statement in general terms of the plan adopted for the command as a whole. This may be a repetition of the decision reached through the seacoast artillery commander's estimate of the situation or it may be based on instructions received from higher authority.

2. *Organization.*

Relationship of the defense to adjacent harbor defenses or to subsector, sector, or higher command organization. Boundaries, if any, of sector or subsector within which the defense is located.

General plan of forts, batteries, searchlights, underwater listening posts, observation posts, command posts, other accessories, and obstacles, including charts showing possible fields of fire.

Defensive sea areas in the vicinity.

Assignment of troops initially available to the defense, with organization of groups and groupments, if any.

Assignment of additional troops as they become available, with reorganization of groups and groupments, if necessary.

Designation of water subareas.

Organization of defense headquarters.

3. *Detailed plan of operations.*—Detailed plans for the employment of each element of the command, to include:

Mission of each next lower command element, including groups when organized, and positions and missions of reinforcing artillery.

Submarine mines; planting, maintenance, protection, and use.

Illumination.

Antiaircraft defense.

Local security, including obstacles and antimechanized defense.

Intelligence.

Liaison and cooperation with the Navy, air forces, and adjacent or supported troops.

Defense against chemical attack.

NOTE.—Details of many of the above items may be covered in annexes to the basic plan.

4. *Administrative plan.*

Supply: Rations, ammunitions, signal, engineer, etc.

Shelter.

Evacuation.

Traffic; construction and maintenance of roads; circulation.

Organizations trains: Location and movement.

Personnel: Mail, welfare.

Training: Programs, schedules, inspections.

5. *Signal communication.*

Assignment of existing wire lines and radio facilities.

Installation and assignment of additional signal communication.

Instructions as to maintenance and use of wire and radio communication.

Location, establishment, and assignment of—

- (1) Command posts and message centers.
- (2) Axis of signal communication, if any.
- (3) Plotting stations.
- (4) Observation stations.

CHAPTER 17

COMMANDS AND ORDERS

	Paragraphs
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II. Commands and orders.....	299-308
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SECTION I

GENERAL

■ 294. TYPES OF ORDERS.—Seacoast artillery commanders' orders for employment of their commands are issued as complete written field orders, oral orders, or commands. There are certain conditions, however, peculiar to employment of seacoast artillery, particularly harbor defense units, which affect the scope and form of all orders concerning it.

■ 295. SPECIAL CONDITIONS AFFECTING SEACOAST ARTILLERY.—
a. Preparation of plans in advance.—The fixed character of harbor defense artillery installations and the knowledge of local hydrography and topography make it practicable to prepare plans in advance. Such plans normally include provision for such matters as organization of groupments and groups, and missions, methods of employment, administrative details, plans for communication, location and sectors of fire of mobile batteries, coordination of artillery fires, local defense, and intelligence. Based on the harbor defense plan, groupment, group, and battery commanders prepare defense plans for their particular commands. When it is practicable for such detailed plans to be prepared and for personnel concerned to become thoroughly familiar therewith in connection with peacetime training, a complete written field order should not be required.

b. Necessity for prompt decision.—The high speed, mobility, and freedom of movement of naval vessels result in a series of rapidly changing situations during action, each of which

requires a prompt decision on the part of the seacoast artillery commander as to employment of his command. These essential decisions and issuance of necessary orders can be expedited when the commander has direct observation over the situation with which he is concerned. This direct observation is essential for lower tactical echelons of command such as the group. However, some of the command posts of the higher echelons of command such as a large harbor defense will often be located in bombproof shelter and observation facilities will be limited or removed from the immediate vicinity of the command post. The extensive water area covered by larger commands may prevent personal observation of all situations on the part of the commander. When such conditions exist the commander will have to form his decisions on his limited personal knowledge and the information he gains through his observers or other intelligence agencies.

■ 296. ORAL ORDERS.—It follows from the conditions outlined above that orders for employment of elements of seacoast artillery in action are oral, more or less fragmentary, and are normally transmitted by telephone. In order to expedite transmission and to insure that oral orders will be understood, they should where possible follow the general forms prescribed for commands.

■ 297. SUBAREAS.—*a. Division into.*—The water area adjacent to a fort or harbor defense is divided by the harbor defense commander into subareas. The boundaries of subareas are chosen so that they may be recognized from the various observation and command stations and each subarea is identified by a name taken from some prominent feature in or near the subarea. Figure 11 shows a typical division into subareas. Ship A would be indicated by "Target —, Limbones —, etc.," and ship B by "Target —, Monja, etc.," or by "Target —, Monja right —, etc."

b. Relocation of targets.—Where there are several vessels of the same type in the same subarea, it may be necessary to relocate the desired target for the station receiving the assignment, transmitting to that station the approximate range and azimuth. Targets may also be relocated by reference to

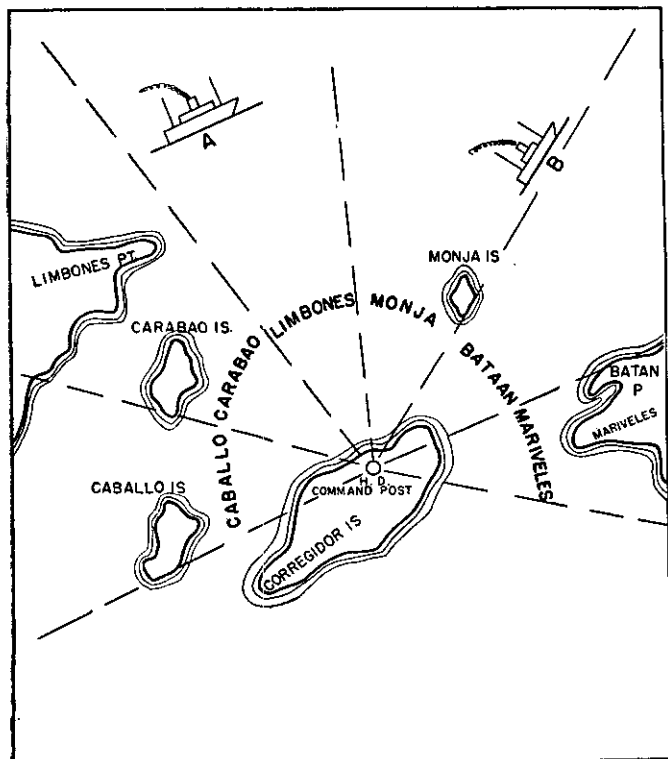


FIGURE 11.—Subdivision of harbor defense water area.

lettered and numbered squares which have been superimposed on a water subarea or area.

■ 298. OBSERVING AND AIMING POINTS.—Observing and aiming points for observers and gun pointers, unless otherwise designated by the officer assigning the target, will be as follows:

a. For vessels having one or more funnels, the center or rear center funnel.

b. For vessels having masts but no visible funnels, the center or rear center mast.

c. For *other vessels*, the point designated by the officer assigning the target.

d. In general, it is desirable to observe and spot on an aiming point on the after portion of a ship rather than on the forward portion. An analysis of the Battle of Jutland revealed that a large proportion of the hits on capital and other ships were well forward, and that a large number of salvos fell across or just ahead of the bow of the target ships. This result is explained by the fact that a ship may move about one third its length while the splash is rising, and that whereas a splash may, to a deflection observer, appear to be in line with the foremast, the projectile may actually have passed in front of the target. Observing and spotting on a point on the after portion of a ship will tend to correct this error.

SECTION II

COMMANDS AND ORDERS

■ 299. GENERAL.—A command is the will of the commander expressed in a prescribed form and designed to initiate a certain action. In the identification and assignment of targets, it is possible to design a system of commands for the initiation of a desired course of action. Such commands have the advantage that they are brief, are easily understood since they follow a prescribed form with which all ranks are familiar, mean only one thing to a trained command and consequently cannot be misinterpreted, and are quick and institute instant action.

■ 300. ELEMENTS OF A COMMAND.—A command for action by seacoast artillery consists of the following elements and should be given in the order mentioned:

a. *Unit*.—The unit or units to which the command is addressed, as ALL GROUPS OR GROUP 1, ALL BATTERIES OR BATTERY EUSTIS. This alerts the unit or units addressed.

b. *Target*.—This word is included in the order to give continuity to the command.

c. *Water area*.—The name of the water area or subarea to which it is desired to direct attention of the unit or units addressed. At night in addition to the subarea the number

of the searchlight which is covering the target should be given.

d. Designation of target.—Designation of target, that is, name (or type and class) of an isolated ship or the designation of division, formation, or ship number, or any sufficient description. Ships are numbered in column from the leading ship or if not in column from the starboard (right) ship of the formation.

e. Fire action.—The character of the fire action desired and when the action is to begin.

■ 301. TYPE COMMANDS USED BY HARBOR DEFENSE OR GROUPMENT COMMANDER.—Type commands used by a groupment commander or a harbor defense commander where there is no echelon of groupment follow:

a. ALL GROUPS.

TARGET: BALBOA.

BATTLESHIP DIVISION IN COLUMN.

LEADING SHIP.

DESTRUCTION FIRE.

COMMENCE FIRING.

b. GROUPS 1 AND 2.

TARGET: LYNNHAVEN.

CRUISER DIVISION IN COLUMN.

GROUP 1, SHIPS 1 AND 2.

GROUP 2, SHIPS 3 AND 4.

NEUTRALIZATION FIRE.

FIRE WHEN IN RANGE.

c. GROUP 1.

TARGET: ATLANTIC.

DESTROYERS LAYING SMOKE SCREEN.

NEUTRALIZATION FIRE.

COMMENCE FIRING.

■ 302. TYPE COMMANDS BY GROUP COMMANDER.—Type commands used by a group commander follow:

a. ALL BATTERIES.

TARGET: BALBOA.

BATTLESHIP DIVISION IN COLUMN.

LEADING SHIP.

COMMENCE FIRING.

b. BATTERIES BARLOW AND BUTTERFIELD.**TARGET: LYNNHAVEN.****BATTLESHIP DIVISION IN COLUMN.****BARLOW, SHIP 1.****BUTTERFIELD, SHIP 2.****HALF RATE.****COMMENCE FIRING.****c. ALL BATTERIES.****TARGET: ATLANTIC.****DESTROYERS LAYING SMOKE SCREEN.****LEADING SHIP.****COMMENCE FIRING.****d. ANDERSON.****TARGET: OCEAN VIEW.****CRUISER.****AT ---- SECONDS INTERVAL.****COMMENCE FIRING.**

■ 303. TYPE COMMANDS BY BATTERY COMMANDER TO TRACK.—A battery commander, having identified a target assigned to him by a group commander, indicates it to all observers, spotters, and gun pointers. When observers, spotters, and gun pointers have reported ON TARGET, the battery commander commands TRACK. In order to expedite obtaining firing data, the command TRACK should be given to the observers as soon as they have identified the target without waiting for spotters and gun pointers to report. Unless otherwise specified, the system of position finding normally employed at the battery is used at the command TRACK. Examples of commands by battery commanders to assign a target and to initiate tracking are as follows:

a. TARGET: OCEAN VIEW.**BATTLESHIP MARYLAND.****(Observers, spotters, and gun pointers report ON TARGET.)****TRACK.****b. TARGET: LYNNHAVEN.****OIL TANKER, CLASS 1-3.****HORIZONTAL BASE (designating stations to be used, as B¹—B², or BAKER—DOG).****(Observers, spotters, and gun pointers report ON TARGET.)****TRACK.**

c. TARGET: BOCA CHICA.

DESTROYER DIVISION IN LINE.

SHIP ONE.

VERTICAL BASE (designating station to be used, as EASY).

(Observers, spotters, and gun pointers report ON TARGET.)
TRACK.

■ 304. TYPE COMMANDS BY BATTERY COMMANDER TO INITIATE OR SIMULATE FIRING.—Examples of commands by battery commanders to initiate firing are as follows:

(If appropriate, these commands may be preceded by the command BATTERY ATTENTION.)

a. TARGET PRACTICE AMMUNITION.

NUMBER ONE.

ONE ROUND.

COMMENCE FIRING.

b. SERVICE AMMUNITION.

BATTERY RIGHT (LEFT).

HALF RATE (omit when full rate is intended).

COMMENCE FIRING.

(At this command, in each salvo the guns of a battery fire successively at a specified time interval between shots. BATTERY RIGHT requires the right gun to fire the first shot with the firing progressing to the left.)

c. DUMMY AMMUNITION.

BATTERY RIGHT (LEFT).

FOUR SALVOS.

COMMENCE FIRING.

■ 305. OTHER COMMANDS.—Other commands used by seacoast artillery commanders are:

a. *Cease firing*.—This directs firing to cease instantly.

b. *Change target*.—This directs firing to cease instantly, but requires subordinate commands to be held ready for a new assignment of target.

c. *At ease*.—Troops remain at their posts, but not alert.

d. *Rest*.—Troops may leave their posts, but must remain in vicinity. Telephone operators must be within hearing distance of their telephones.

e. Close station.—This has the effect of dismissing all personnel engaged in the drill, practice, or action.

■ 306. ACTION ORDERS.—Under certain circumstances it may be possible to prescribe action orders for a command. These are orders similar in nature to flag signals used by the navy prescribing the action to be taken by elements of the command in the distribution of fire. This type of command has the advantage of saving time in a rapidly moving situation and is particularly valuable in preserving continuity of action in a continuing situation where such an order, or orders, have been given, and subsequently communication falls between the higher command and subordinates. Examples of action orders are as follows:

a. Action 1.—One battery (to be designated by the group commander) of each of the groups designated by the groupment or harbor defense commander will fire on the leading ship in column (or right ship in line) and thereafter on each succeeding ship in turn.

b. Action 2.—Each group designated to fire will concentrate its fire on a single ship. The formation of ships initially fired upon will consist of as many ships taken from head to rear of the column (or right to left of the line) as there are groups firing. Each group will shift its fire to the corresponding ship of each succeeding formation of ships in turn.

c. Action 3.—All batteries of the group or groups designated by the groupment or harbor defense commander will fire, each battery of a group on a separate ship. The formation of ships to be fired on by each group will be determined by the designation of base ships, each of which will be the leading (or right) ship in its respective formation.

d. Action 4.—All batteries of the group or groups designated will fire on the leading (or right) ship and then on each succeeding ship in turn.

e. Any number of such orders may be prescribed in advance for a particular command. Needless to say, the personnel of the command must be thoroughly indoctrinated in the use of the particular commands to be employed.

■ 307. INITIATION OF ACTION ORDERS.—The prescribed action orders may be put into action by the groupment or harbor defense commander by the following commands:

a. GROUPS—(designate the groups which are to receive and record the command).

b. ACTION ORDER FOR GROUPS—(designate the groups which will go into action in compliance with this command).

c. TARGET: (1) Location. (2) Designation. (3) Formation.

d. ACTION—, and if necessary,

e. SHIPS—, the BASE SHIPS.

f. CLASS OF FIRE (if designated).

g. COMMENCE FIRING (or FIRE WHEN IN RANGE).

h. Group commanders will cause fire of their batteries to be shifted as prescribed in the action order in effect when the target being fired on is out of action or disabled.

■ 308. APPLICATION OF ACTION ORDERS.—The examples of action orders given in paragraph 307 would have application as follows:

a. In the command—

GROUPS 1 AND 2

TARGET: LYNNHAVEN

BATTLESHIP DIVISION IN COLUMN

ACTION 1

COMMENCE FIRING

one battery (to be designated by the group commander) of the 1st and 2d Groups would fire on the leading ship and thereafter on each succeeding ship in turn.

b. In the command—

GROUPS 1 AND 2

TARGET: LYNNHAVEN

BATTLESHIP DIVISION IN COLUMN

ACTION 3

SHIPS 1 AND 3, BASE SHIPS

COMMENCE FIRING

the group commander of Group 1 would assign one battery to Ship No. 1 and one battery to Ship No. 2; the group com-

mander of the 2d Group would assign one battery to Ship No. 3, and the other battery to Ship No. 4 (assuming that each group was made up of two batteries).

SECTION III

FIELD ORDERS

■ 309. GENERAL.—See FM 101-5 for a general discussion of the field order. The information and instructions contained in the seacoast artillery field order are appropriate to the particular missions and methods employed by that arm.

■ 310. HARBOR DEFENSE ORDERS.—*a. Field orders* are issued by harbor defense and groupment commanders when their commands are assuming battle positions, and from time to time thereafter as required by changes in the tactical situation due to new developments pertaining either to the enemy or to our own troops. Thus a field order would be necessary to effect reorganization of a harbor defense which had been reinforced by mobile artillery or other units not contemplated by defense plans; an initial field order would be required upon establishment of a temporary harbor defense by mobile artillery at a previously unfortified point; and a field order would properly be issued when new units whose commanders have had no opportunity to become familiar with the defense plans are assigned to an established harbor defense. Group commanders may issue field orders under similar conditions.

b. Scope.—(1) In general, scope of initial field orders of the harbor defense or subordinate units will depend upon scope and thoroughness of approved mobilization and defense plans. In a highly organized garrisoned harbor defense practically no orders are necessary in assuming battle positions. On the other hand, in newly formed harbor defenses at previously unfortified points or where harbor defenses are strongly reinforced, a most complete order would be necessary.

(2) Within the framework of the order, the extent to which details will be prescribed will vary with experience and training of subordinate commanders; their character and trust reposed in them by their superiors; type of operation,

complex or simple, centralized or decentralized control; and on clarity of the situation.

(3) The amount of information to be placed in paragraphs 1, 2, 3, and 5 of the order can be reduced frequently by reference to an annex; reference to S-2 reports or situation maps may likewise reduce the amount of detailed information under paragraph 1. When an administrative order is issued, paragraph 4 of the field order is merely a reference to the administrative order together with such special administrative details as affect immediately and directly tactical dispositions of subordinate combat units.

c. Check list for field order.—The following check list of a field order for a harbor defense is intended as a guide only and should not be followed blindly. Field orders of subordinate elements of a harbor defense or subsequent field orders of a harbor defense follow the same general check list.

CHECK LIST FOR A FIELD ORDER FOR A HARBOR DEFENSE

1. *Information.*

Enemy: Location, strength (known or estimated), composition, dispositions, designation of units if known, rate and direction of movement of hostile elements which may influence action of this unit; report of special activities (naval, air, or land). Refer to situation map or intelligence report, if issued, for details.

Friendly troops: Designation, mission or operation, and location of higher or adjacent units, or units within supporting distance; support by naval local defense forces, beach defense forces, air service, and antiaircraft artillery units (if not a part of the unit issuing the order). Refer to proper annex or operation map, if issued.

2. *Decision of the commander* or statement of mission of unit issuing order. Details of general application; time at which battle positions will be occupied.

TROOPS

List for each groupment, group, and separate battery, commander, troops assigned, and armament, as:

— Groupment.

Commander:

Group 1.

Commander: (When troops assigned do not comprise a tactical unit.)

Troops:

Armament:

Group 2 (Groups are numbered consecutively within the harbor defense.)

Same as above.

Miscellaneous units such as antiaircraft artillery, observation aviation, searchlight, and other units under harbor defense control.

3. In a separate lettered subparagraph for each groupment, separate group, or separate battery when held directly under harbor defense commander, state mission and give general and special instructions pertaining to positions (for mobile armament only), employment of armament, observation of water areas, star shell illumination, protection of mine fields, nets, booms, and other obstacles, and support to be furnished beach defense forces.

Instructions to antiaircraft artillery units. Refer to annex when one is issued.

Instructions to searchlights. Refer to annex when one is issued.

Instructions to subaqueous listening and sound ranging elements. Refer to annex when one is issued.

Instructions to other attached units.

- x. Instructions applicable to two or more units or elements or to the entire command which are necessary for coordination but do not properly belong in another subparagraph, such as water areas, sectors of fire, mine barriers, and other obstacles; local defense against landing parties and hostile aircraft; liaison with naval local defense forces and adjacent units of other arms; and action to be taken in a chemical attack.

4. When an administrative order is issued, refer to it by number; when not issued, give such instructions as to supply, evacuation, traffic, trains, and personnel as may be necessary.
5. *Signal communication and fire control*: Refer to annex when one is issued.

Command posts: Give initial location of command posts of unit issuing order and of next lower units; times of opening of command posts.

Annexes.—The following annexes are usually issued with a harbor defense field order:

- , Artillery Positions, Obstacles, Sectors of Fire, and Water Areas.
- , Plan of Signal Communication and Fire Control.
- , Plan of Coordination of Artillery Fires.
- , Plan of Illumination.
- , Organization of Ground for Local Defense.
- , Administrative Orders —.
- , Intelligence.

Distribution: (Copies should be sent to each officer or unit directly concerned with the execution of the order and to higher headquarters and such adjacent units as may be necessary. List individuals and units and indicate number of copies to each.)

■ 311. MOBILE SEACOAST ARTILLERY ORDERS.—*a. Field orders* for railway and tractor-drawn artillery units follow the harbor defense check list whenever possible. They follow the general outline given in FM 101-5.

b. Check list for a field order.—The following outline is suggested for movements into and occupation of positions:

1. *Information*.

Enemy: Location, strength (known or estimated), composition, dispositions, designation of units if known, rate and direction of movement of hostile elements which may influence action of this unit; report of special activities (naval, air, or land). Refer to Situation Map or Intelligence Report, if issued, for details.

Friendly troops: Designation, mission or operation, and location of higher or adjacent units, or units within sup-

porting distance; support by naval local defense forces, beach defense forces, air service, and antiaircraft artillery units.

2. *Decision of the commander*, or statement of mission of unit issuing the order. Details of general application, time at which positions will be occupied or when units will be prepared for action.

TROOPS

List for each groupment, group, and separate battery; the commander, troops assigned, and armament, as:

Upon arrival at positions, units will be formed into groupments and groups as indicated below.

— Groupment.

Commander:

Group 1:

Commander:

Troops:

Armament:

Group 2

Same as above. Designate commander when the troops assigned do not comprise a tactical unit.

— Groupment.

Same as above.

3. In a separate lettered subparagraph for each groupment, separate group, or separate battery, state mission and give instructions pertaining to the following when they apply:

Positions.

Routes and movements.

Employment of the armament.

Observation of water areas.

Star shell illumination.

Protection of mine fields and obstacles.

Support to be given beach defense forces.

Instructions to attached units.

- x. Instructions applicable to two or more units or elements, or to the entire command, which are necessary for co-ordination but do not properly belong in another subparagraph, such as: water areas, sectors of fire, mine

barriers and other obstacles; local defense against landing parties and hostile aircraft; liaison with naval local defense forces and adjacent units of other arms; the action to be taken in a chemical attack; security measures on the march or when halted; provisions to insure secrecy and camouflage discipline.

4. When an administrative order is issued, refer to it by number; when one is not issued, give such instructions as to supply, evacuation, traffic, trains, and personnel as may be necessary.
5. *Signal communication and fire control.* Refer to annex when one is issued.

Observation posts.

Command posts. Give location of command posts of unit issuing order and of next lower units; times of opening of command posts.

■ 312. ANNEXES.—*a.* Annexes are attached to field orders when the amount of detail necessary under a particular subhead is such as to make the field order itself too voluminous. In such cases the additional instructions appear as annexes and accompany the order. Any field order must however contain in itself all information necessary to the unit as a whole regardless of the annexes.

b. Annexes to the same field order are numbered serially and reference is made to them in the proper paragraph. They are prepared by the appropriate staff officer for the approval of the commander, are signed by the chief of staff (or executive), and are authenticated by the appropriate assistant chief of staff.

c. A brief description of the more frequently used annexes follows:

(1) *Artillery positions and sectors (fields) of fire, mine fields, obstacles, and water areas.*—This is a map or chart, or an overlay, on which is marked location of each battery, sector of fire for guns having limited traverse, location of mine fields and obstacles by symbol showing the type of each and division of the water into subareas for fire-control purposes. By reference to this annex in paragraph 3 *x* of a field order a lengthy description of the position of each tactical unit in paragraph 3 *a, b, c,* may be avoided.

(2) *Organization of ground for local defense.*—This is usually issued in the form of a map, sketch, or blueprint showing general location of barbed wire entanglements, trenches, machine guns, and of means provided for defense of the command against raids or airplane attacks. Each battery prepares a similar plan showing more detailed dispositions for local defense.

(3) *Plan of signal communication and fire control.*—This is the plan for the operation and coordination of all means of signal communication employed by the command. It includes signals used and method of communicating with airplanes engaged in adjusting fire for the batteries, and with elements of naval district forces.

(4) *Plan of illumination.*—This is the plan for operation and control of searchlights and for use of star shell and airplane flares.

(5) *Plan for coordination of artillery fires.*—This plan contains the commanders' carefully worked out ideas on fundamentals of tactical employment of groupments of a harbor defense or groups of a groupment in general situations which may arise in combat. All commanders should be especially familiar with this plan as it will be their guide in direction of fire in case communication with the next higher commander is severed.

■ 313. MAPS AND CHARTS.—*Maps, tracings, and charts* may often be employed advantageously in connection with field orders. Areas for positions, locations of prearranged fires, dispositions of supporting or neighboring troops, scheme of maneuver, and many other details of orders issued can often be shown clearly on an operation map, and a corresponding reduction may be made in the length of the written order.

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Caannon	Carriage			Projectile		Maximum range, yards	Rate of fire, rounds per minute	Time to emplace
	Type	Maximum elevation (degrees)	Traverse (degrees)	Kind	Weight, pounds			
16-inch gun	Barbette	65	360	AP projectile	2,100 2,340	44,700 49,100	3½	
16-inch howitzer	Barbette	65	360	AP projectile	2,100	24,500	3½	
14-inch gun	DC	20	170	AP shot	1,560	25,000	3½	
	Railway	50	7	HE shell	1,215	48,200	½	8 hours. ² 10 days. ³
			360	AP projectile	1,560	42,280		
12-inch gun	DC and old barbette	15	170	AP projectile	975	18,400	1½	
				AP shot and shell	1,070	18,000		
	Barbette	35	360	AP projectile	975	30,100	1½	
				AP shot and shell	1,070	26,800		
	Railway	38	10	AP projectile	975	30,100	½	4 hours. ² 10 days. ³
			360	AP shot and shell	1,070	27,500		
12-inch mortar	Fixed and railway	65	360	DP shell	1,046	11,345	1½	3 hours.
					824	12,280	(Fixed) 3½	
					700	14,650	(Railway)	
10-inch gun	DC	12	170	AP shot and shell	617	14,100	1½	
				HE shell	510	14,700		
8-inch gun	DC	12	120	AP shot and shell	323	12,900	1½	
				AP shell	260	14,200		
				HE shell	200	12,400		
	Railway	42	360	HE shell	200	21,300	1½	3 hours.
				AP shell	260	23,900		
6-inch gun	DC	15	170	AP shot and shell	108	14,600	4	
				HE shell	90	12,900		
	Barbette	20	360	AP shot and shell	108	16,000	5	
				HE shell	90	14,800		
3-inch gun	Barbette	16	360	HE shell	15	11,000	12	
155-mm gun	Tractor-drawn	35	60	HE shell	95	17,400	3	1 to 6 hours.

¹ Some limited to 55°.

² Mounted on field platform.

³ Includes construction of concrete emplacement for all-around fire

FIGURE 3.—Characteristics of principal types of seacoast artillery.